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The Back-room Boys

The last issue of the " American Foundryman " to reach us contains, as its leading article, Salute to A.F.S. (American Foundrymen's Society) Committees. In it, tribute is paid to the 500 members who, in the interests of public service, form their personnel. This reminded us that we, too, in this country, owe much to the 150 members who serve on the various committees of the Institute of British Foundrymen. These people, at their firm's or maybe their own expense, have made and are making a magnificent contribution to the technological advancement of the industry. The range is especially wide and has so far embraced subjects so widely different as costing and cupolas.

We doubt, when foundrymen are working to a specification, if they ever stop to consider the enormous amount of voluntary work that was done on behalf of the industry before the specification became current. Again, when insisting on a slightly oxidising atmosphere when melting non-ferrous alloys, do executives ever stop to think where this information originated? Maybe they think they read it initially in the JOURNAL, but they should remember that the technical Press largely mirrors such information, though it does often originate the policy from which developments arise. Others within the industry look back with pride and interest on the benefit they have derived from taking the City and Guilds of London Institute's examinations. Do they, we wonder, appreciate the time and trouble spent by members of the Institute in the launching and carrying through of the scheme? It is germane to recall that most prominent members of Institute's committees do not reach their position without having served a sort of apprenticeship. By this we mean that, prior to their election, they have usually done sterling work on Branch Councils and have contributed worth-while Papers to the Proceedings.

With the passage of time, all these things are taken for granted, like the Employment Exchanges, social services and food rationing, but foundrymen should remember that most technical and educational developments, such as we have mentioned, have their origin in the personal sacrifice of time and energy by their energetic and enlightened colleagues. The excellent work being done is unique in one aspect. That is, the work of the various committees is being followed at first hand by a selected few of the brightest youths in the industry at no cost to the boys themselves. This form of education induces a new, and not to be underrated, type of culture comparable with that enjoyed by undergraduates of the older universities, when they are guests of the higher staff for quiet social recreation. In emulating the Americans in our " Salute to the Committees," we think it right to draw attention to the fact that such work, to be successful, involves a high standard of leadership. In this, the Institute has been particularly fortunate and we would include in this tribute special thanks to Mr. J. W. Gardom, Mr. P. A. Russell, Mr. A. E. Peace and Mr. L. W. Bolton for major personal sacrifices they have made in the interests of technological advancement.

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E

Institute of Metals

Autumn Meeting in Paris

The 1949 Autumn Meeting in Paris of the Institute of Metals (tentatively announced to commence on September 26) will actually start on October 3, and modifications have also been made as to the duration of the meeting. It now coincides with the annual meeting of the *Société Française de Métallurgie*. The technical sessions of both meetings will be held at the Maison de la Chimie, but the French society's discussions on non-ferrous metallurgical subjects will not clash with those of the Institute of Metals. It will be in two parts: Part I, October 3 to 8, in Paris, and Part II, October 9 onwards, which will consist of a series of tours. The following is the programme.

Part I

On the morning of the first day, the secretary's office will open for registration and the issue of tickets, badges and general information. Visits will take place in the afternoon, and in the evening Prof. Georges Chaudron, of the Sorbonne, will deliver the Autumn Lecture on recent scientific and technical progress in the field of light alloys. Technical sessions will occupy the mornings of three days in this week. On three afternoons there will be visits to works or other places of interest, and, on one afternoon, members will join with the members of the *Société Française de Métallurgie* in the Osmond Centenary ceremony, in the Grande Amphitheatre of the Sorbonne, when the President of the Republic is expected to be present. The *Société Française* will hold a banquet; the Institute will give an informal cocktail party, and other social functions may be organised.

Visits.—Afternoon visits have been arranged to Versailles (members and ladies); the Michelin pneumatic-tyred railway train; the assembly plant of the Société Facel-Metallon (Colombes); the Renault works; the *Centre Technique de L'Aluminium* (including the foundry); the Morane-Saunier works; the Japy works (Arcueil); the *Laboratoire de la Recherche Scientifique Appliquee* (Bellevue); Prof. Chaudron's Laboratories at Vitry-sur-Seine; the Saint-Maurice cable works, and further part-day and whole-day excursions, including a visit to the Montupet foundries at Creil.

Part II

This section consists of short tours arranged for those members and ladies who can remain in France. *Tour* (*a*) includes visits to works at Issoire and Clermont-Ferrand, combined with a tour of the Massif Central. *Tour* (*b*) includes the research establishment of the *Compagnie Alais Froges et Camargue* at Chambery; the laboratory of the tin works at Annecy, and an aluminium works in the Savoie, to be combined with a sightseeing tour in the region. *Tour* (*c*) embraces the castles of Loire Valley and a visit can be arranged to the *Ateliers D'Emboutissage Facel-Metallon*. *Tour* (*d*) covers a visit to the Normandy beaches and the Dives works of the *Compagnie Général du Duralumin et du Cuivre* and *Fermeture Eclair* at Petit-Quevilly, near Rouen.

Fourth Empire Mining and Metallurgical Congress

Commonwealth Resources Reviewed

The Fourth Empire Mining and Metallurgical Congress concluded its programme of works' visits on July 23. The Congress, which had been in session since July 9, first at London and then at centres in Oxford, South Wales, Scotland, Cornwall and North-east England, was attended by experts from 28 countries. The whole field was admirably covered and mining and metallurgical projects throughout the world were widely discussed. New methods of prospecting, new ore fields, methods of extraction treatment, fabrication, and concentration were but a few of the topics which formed the subjects for the technical session at Oxford. Perhaps the main value of the sessions was that a meeting place was provided for exchange of ideas. There were 20 delegates from Canada, 20 from India, 18 from Australia, others from South Africa (18), America (7), Gold Coast (4), Tanganyika, New Zealand, British Guiana, Nigeria, Kenya, Rhodesia, Egypt, Iraq, Chile and Continental countries. Over 300 delegates from Great Britain were present.

New Deposits Necessary

Figures were given showing the enormous increase in the use of minerals, the depletion of many sources and the danger of serious restriction of industry unless new deposits of minerals were found and better use was made of the existing sources by skilful mining. Minerals which were of little importance then have, since the last Congress in 1930, become eagerly sought after.

The health of the workers in metallurgical industries in relation to output, was the subject of a series of Papers, and general recommendations were made regarding the effect of ventilation and general working conditions on the efficiency of the personnel.

The Congress, which was convened by the Empire Council of Mining and Metallurgical Institutions, was first held with the support of the Governments of the Empire at the Empire Exhibition, Wembley, in 1924, and was so successful that it was decided that it should be triennial. The second Congress was in Canada in 1927 and the third in South Africa in 1930. Col. G. M. Carrie, chairman of the organising committee (and in charge of Defence Research Liaison, Canada House), announced at the conclusion of the Oxford session that the fifth Congress would be held in Australia in 1953. It was suggested for this meeting that one session be held on the economic aspects of the mining and metallurgical industries, also that Papers should deal with broad general topics rather than descriptions of individual plants and mines, *i.e.*, fewer Papers and more discussions.

AS FROM NEXT MONTH the Journal of Research and Development, hitherto a confidential publication issued by the British Cast Iron Research Association to members only, will be published on a subscription basis.

The Influence of Heating Rate in Malleable Iron Annealing*

By S. W. Palmer, A.R.I.C., A.I.M.†

INTRODUCTION

Recent developments in the annealing of malleable cast iron have tended to reduce the length of the annealing cycle. This has been accomplished to some degree by the control of chemical composition, so that more readily graphitised materials are used, and to some extent by the use of annealing furnaces which permit more rapid heating and cooling rates. In respect of this latter point, the introduction of the electrically-heated furnace using a controlled gaseous atmosphere is having an important influence in both whiteheart and blackheart annealing practice. The use of such a furnace permits the elimination of packing material and annealing pots, and a considerable shortening of annealing cycles can be obtained.

At first, it would seem that one way of shortening the annealing cycle would be to speed-up the rate of heating, and that, provided the same annealing time at the top temperature and the same cooling rate were used, then the resulting product should be the same, regardless of the rate of heating. It is the object of this Paper to show that the rate of heating has an important influence on the process of graphitisation after the top annealing temperature has been reached, and that the final microstructure obtained depends to a considerable degree upon the rate of heating. In fact it would appear that there is, for instance, a metallurgically imposed limit to the extent to which rate of heating can be increased and that. if the heating rate be increased beyond a certain point, then the object of this increased rate, namely, the shortening of the annealing cycle, might well be defeated.

Experiments with Whiteheart Malleable Iron

It will be recalled that, as reported in Section I of the previous Paper,[1] whiteheart material of varying silicon, manganese and sulphur contents was obtained from eighteen oil-fired crucible furnace melts. From each of these melts were cast 0.564 in. dia. shaped tensile bars, 0.875 in. dia. bars and ¾ in. standard "bend" bars, there being five taps of metal from each melt to give five different sulphur contents. The test-bars were packed in ore of strength six parts of old to one of new, with a 2 : 1 ore to metal ratio, and were annealed in an electric annealing furnace. The annealing cycle employed consisted of:—12 hours heating to 1,000 deg. C.; 100 hours holding at 1,000 deg. C.; and 36 hours cooling down to 600 deg. C. The mechanical test results and microstructures reported in the previous Paper were obtained from the use of the above cycle.

In order to investigate any effect that heating rate may have on whiteheart malleable iron, further test-bars of some of these melts were annealed under the same conditions and annealing cycle, except for the use of a slower rate of heating up to the annealing temperature. In this second experiment the time taken to heat the test-bars from 500 to 1,000 deg. C. was 45 hrs., as compared with 12 hours for the first experiment. The experiment using the heating time of 12 hrs. up to 1,000 deg. C. will hereafter be referred to as "Anneal A" and that having a heating time of 45 hrs. up to 1,000 deg. C. as "Anneal B." In Table I is given the mechanical test results on bars obtained from both annealing experiments.

All yield, tensile and elongation values are an average of two results. If the complete chemical analyses of the above melts are required, then reference can be made to Table I in the previous Paper. The sulphur to manganese ratios given in the above table have been obtained by dividing the actual sulphur content by the actual manganese content.

The sulphur and manganese are balanced to form manganese sulphide when the manganese content equals 1.72 times the sulphur content. Hence when the ratio $\frac{S}{Mn} = 0.58$ there is excess of neither element. If the ratio is less than 0.58 there is more manganese than can combine with sulphur, while a ratio exceeding 0.58 indicates more sulphur than is required to form manganese sulphide with all the manganese content.

A metallographic examination of the material obtained from Anneal B (45 hrs. heating) was carried out in the same manner as that already reported for Anneal A. It became obvious immediately that the temper-carbon nodules in the test-bars that had received a 45-hr. heating period were considerably more numerous than in the test-bars from the first anneal, and that the nodule size in Anneal B was generally much smaller. To demonstrate this difference, a nodule count was carried out and the results obtained from this are given in Table II. The procedure for this consisted in counting the number of nodules occurring in a 0.05-

*Presented at the 46th Annual Meeting of the Institute of British Foundry at Cheltenham.

†The Author is on the staff of the British Cast Iron Research Association.

[1]Palmer, S. W., Proc. I.B.F., 1947, Paper No. 876.

Influence of Heating Rate

in. zone across the diameter of each 0.875-in. dia. specimen.

To illustrate the general differences in microstructure between the materials obtained from Anneals A and B the series of photomicrographs obtained from Anneal A and already shown in the previous Paper are repeated in this Paper as the upper half of each of Figs. 1 to 15. The photomicrographs of the corresponding materials of Anneal B are shown as the lower half of the same illustrations.

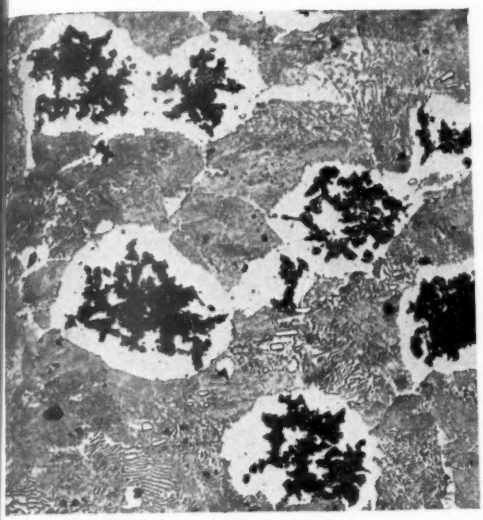
Discussion of Results from Experiments with Whiteheart Material

It is apparent from the results shown in the foregoing that, whereas a rapid heating rate of 12 hrs. up to 1,000 deg. C. has given rise to relatively large temper carbon nodules (generally few in number), a slow heating rate of 45 hrs. up to 1,000 deg. C. has led to the formation of small temper-carbon nodules but present in large number. This difference is well illustrated by the series of photomicrographs and by the nodule count data.

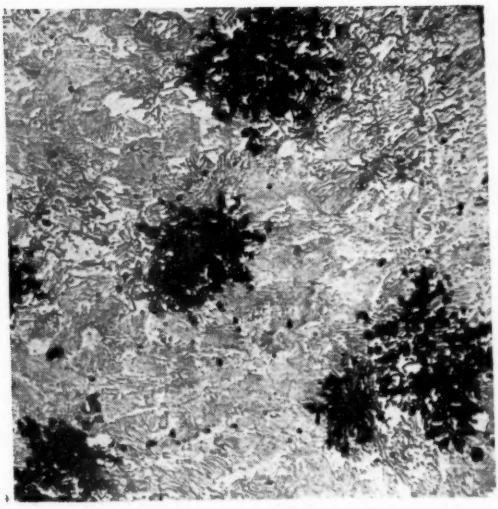
An examination of the mechanical test results does

TABLE I.—*Mechanical Test Results from Rapid and Slow Heating-up Periods.*

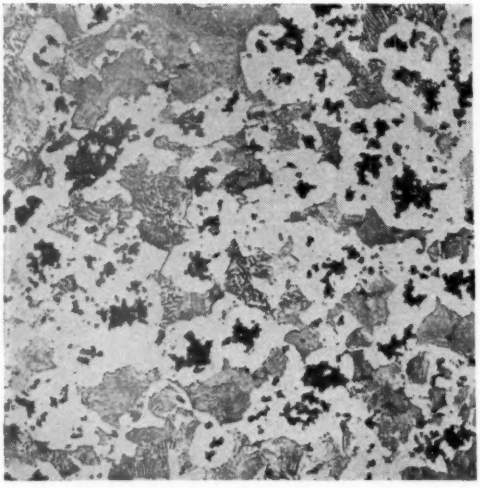
Melt and Tap No.	Si per cent.	S to Mn ratio.	Anneal A. 12 hours heating to 1,000° C.			Anneal B. 45 hours, heating to 1,000° C.		
			Yield stress, tons per sq. in.	Max. tensile stress, tons per sq. in.	Elongation per cent. on 2 in.	Yield stress, tons per sq. in.	Max. tensile stress, tons per sq. in.	Elongation per cent. on 2 in.
2A	0.60	0.40	14.1	26.8	5	13.9	27.5	5
B		0.85	14.3	26.4	4.5	15.9	28.1	3.5
C		1.50	15.1	24.6	4	15.6	24.9	4
D		2.04	14.9	22.0	4	13.4	24.1	4
E	0.54	2.44	14.2	23.7	3	13.1	22.0	4
3A	0.56	0.20	13.4	25.1	5.5	11.0	21.1	5.75
B		0.62	13.9	27.4	5.5	12.4	24.1	6.5
C		1.11	14.8	25.1	4	15.8	28.8	3.5
D		1.54	14.0	24.4	4	16.2	28.6	4
E	0.61	1.89	14.9	23.8	4	16.1	26.4	4.5
6A	0.43	0.08	15.3	28.1	3	14.4	28.4	6
B		0.35	14.8	26.0	4.5	12.5	27.7	8
C		0.59	15.8	26.2	4.5	14.2	25.5	5
D		0.86	14.9	23.9	5	14.0	24.9	5
E	0.36	1.12	13.9	22.2	4	12.9	22.2	5.5
9A	0.45	0.09	16.5	27.8	3.5	12.3	31.7	8
B		0.30	15.8	31.7	5	13.7	27.8	6
C		0.50	16.4	30.7	5.5	13.5	26.7	7
D		0.72	16.4	25.9	4	13.3	25.9	5
E	0.42	0.97	16.0	24.6	5	14.5	24.4	5
11A	0.68	0.14	13.7	24.9	4	13.6	24.8	5
B		0.35	15.2	28.7	5	13.6	24.4	6
C		0.56	14.8	27.3	6	14.1	26.8	7
D		0.83	17.0	26.5	4	16.2	29.5	3.5
E	0.62	1.00	15.9	26.6	4	16.9	27.5	3
12A	0.31	0.15	15.6	28.2	3.5	13.0	30.3	5
B		0.24	16.9	24.9	3	13.9	27.1	7
C		0.44	16.5	30.6	6	12.8	26.3	6
D		0.61	14.6	27.0	5.5	13.9	25.5	4.5
E	0.32	0.71	15.5	26.6	5	14.7	25.9	4
16A	0.44	0.15	16.6	26.8	3	15.5	28.7	4.5
B		0.19	15.8	27.0	3	17.0	31.9	5.5
C		0.25	16.3	28.7	3.5	13.5	29.8	5.75
D		0.44	15.6	30.2	4.5	13.8	26.2	5.25
E	0.35	0.57	15.6	28.4	5.5	13.6	28.0	5
17A	0.63	0.12	17.8	32.5	4	16.7	32.2	5.25
B		0.25	17.3	32.3	5.5	16.7	30.5	5.75
C		0.40	15.7	30.6	6.5	16.1	28.2	6.25
D		0.56	16.0	29.8	7	15.6	27.9	6.25
E	0.62	0.69	16.6	27.1	4	16.4	26.4	5
18A	0.82	0.11	17.9	32.8	5	18.6	33.3	5.5
B		0.24	18.3	33.4	5	17.1	31.4	5.5
C		0.38	17.8	31.3	6	15.7	28.1	6
D		0.52	16.6	28.7	6	15.4	28.7	6.5
E	0.81	0.71	15.8	28.5	4	17.9	28.8	3.5



Anneal A.

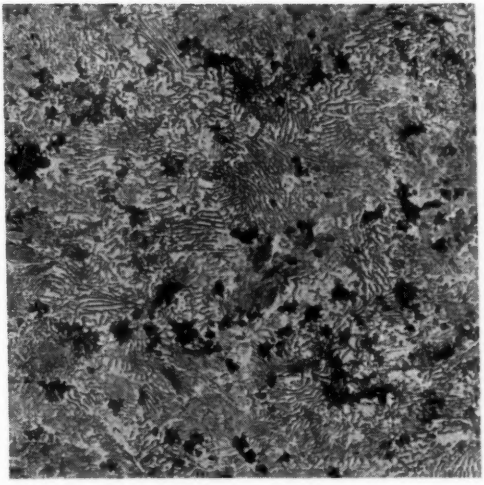


Anneal A.



Anneal B.

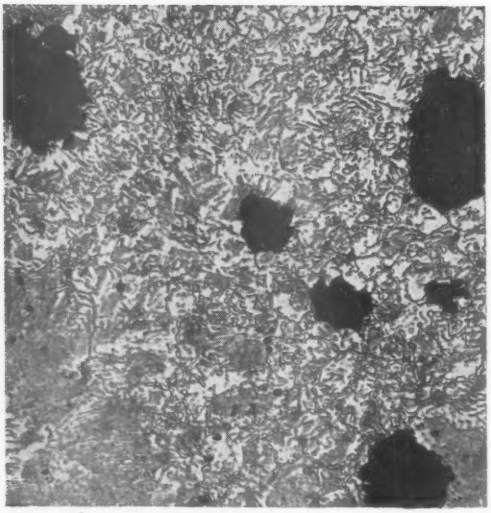
FIG. 1.—BAR NO. 2A. MANGANESE, 0.13 PER CENT. SULPHUR, 0.052 PER CENT.



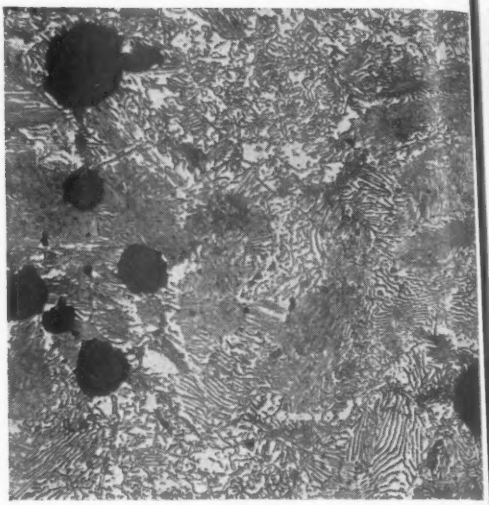
Anneal B.

FIG. 2.—BAR NO. 2B. MANGANESE, 0.13 PER CENT. SULPHUR, 0.110 PER CENT.

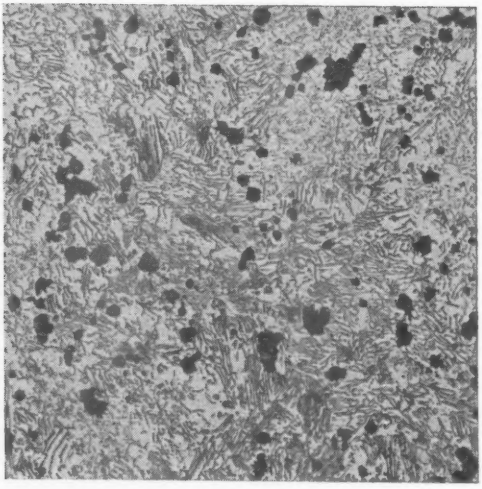
Magnification × 120. Etched in 4 per cent. Picral.



Anneal A.

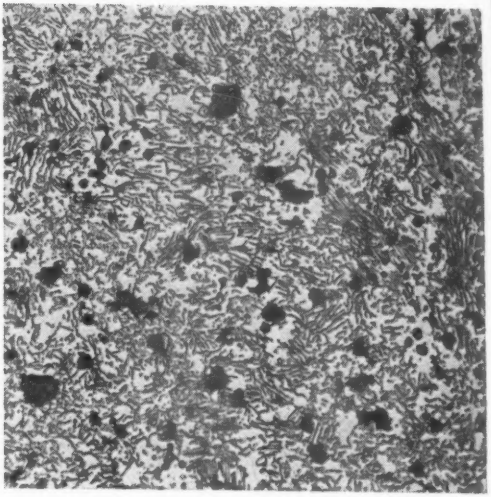


Anneal A.



Anneal B.

FIG. 3.—BAR NO. 2C. MANGANESE, 0.13 PER CENT. SULPHUR, 0.193 PER CENT.



Anneal B.

FIG. 4.—BAR NO. 2D. MANGANESE, 0.13 PER CENT. SULPHUR, 0.193 PER CENT.

Magnification × 120. Etched in 4 per cent. Picral.

TABLE II.—*Number of Nodules in Anneals "A" and "B."*

Melt and Tap No.	Anneal A.	Anneal B.	Melt and Tap No.	Anneal A.	Anneal B.
2A	126	1000	12A	16	80
B	106	804	B	16	230
C	142	750	C	19	212
D	220	1050	D	12	244
E	230	1142	E	18	230
3A	*	282	16A	7	42
B	*	482	B	17	54
C	121	484	C	7	72
D	130	450	D	70	172
E	120	202	E	19	214
6A	12	146	17A	100	464
B	11	284	B	100	478
C	18	102	C	130	590
D	16	174	D	55	732
E	9	248	E	—	702
9A	23	144	18A	55	134
B	22	246	B	140	194
C	12	312	C	67	445
D	22	210	D	260	516
E	12	310	E	122	447
11A	66	378			
B	75	658			
C	47	362			
D	60	458			
E	60	320			

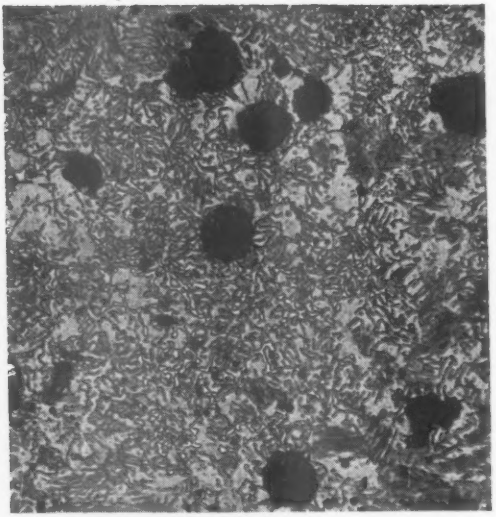
not indicate any marked difference between the materials of Anneal A and Anneal B. Similar trends can, however, be detected with variations in chemical composition. Tensile strength appears generally to decrease with increasing sulphur to manganese ratio for both anneals. Yield strength shows little variation, apart from a tendency to increase in value with higher sulphur to manganese ratios. It does appear that Anneal B materials, containing many more nodules than Anneal A materials, generally exhibit somewhat lower yield strengths. The most conspicuous difference between Anneal A and Anneal B materials is with respect to elongation. An increase in the number of temper carbon nodules in the structure appears to give rise to an improvement in elongation, particularly in those materials having a sulphur to manganese ratio between 0.3 and 0.58, *i.e.*, when a small excess of manganese occurs. This is undoubtedly a consequence of the provision by the larger number of nodules of more centres upon which secondary graphitisation can proceed during cooling, thus resulting in more ferrite in the matrix. In the materials having a sulphur to manganese ratio in excess of 0.58, *i.e.*, having an excess sulphur content and, hence, there being a severe restriction of secondary graphitisation, an increase in the number of nodules does not appreciably improve elongation.

The observations on variation in microstructure with varying sulphur to manganese ratio, recorded in the previous Paper, have been confirmed by the results of Anneal B. These observations can be summarised thus. With high excess manganese content, as in Bar 17A (Fig. 11), the matrix is essentially of fine pearlite. With an increase in sulphur content to partially neutralise the excess manganese content, the amount of ferrite associated with the temper carbon increases as the carbide stabilising influence of the manganese is reduced. This effect is shown in Bars 11A, 11B, 11C, 17B, 17C and 17D (Figs. 6, 7, 8, 12, 13 and 14 respectively). When all the manganese has been rendered ineffective by the sulphur content, and a small excess of sulphur is obtained, the matrix becomes pearlitic again by reason of the excess sulphur which then exerts a marked carbide stabilising influence and suppresses secondary graphitisation. This is apparent in Bars 2B, 11D and 17E (Figs. 2, 9 and 15 respectively). With further increases in sulphur content, as occurring in Bars 2C, 2D and 2E (Figs. 3, 4 and 5), the matrix consists more and more of divorced pearlite, and increasing amounts of the undesirable hyper-eutectoid cementite network occur associated with this constituent. In the Anneal B series, the increased number of temper carbon nodules have resulted in more secondary graphitisation, and hence more ferrite occurs in Bars 11A, 11B, 11C, 17A, 17B, 17C and 17D compared with the corresponding bars in the Anneal A series. (See Figs. 6, 7, 8, 11, 12, 13 and 14.)

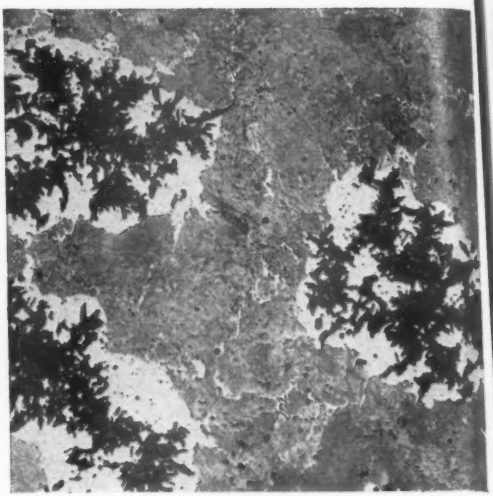
The gradual change from the aggregate-type to the compact-spherulitic type of temper carbon with increasing sulphur content is well illustrated by both Anneal A and Anneal B. It is worthy of note that very little eutectic cementite could be found in the Anneal-B test-bars, even in the low-silicon high-sulphur materials, and in the low-silicon high-manganese materials. Evidently the larger number of nodules in the Anneal B bars had facilitated the decomposition of eutectic cementite during the 100 hrs. at 1,000 deg. C.

Those materials having a balanced sulphur content with a small excess of manganese gave fractures that were black in appearance. The fractures of the test-bars of Melt No. 11 from both Anneals A and B are shown in Fig. 16. The change in fracture from a small excess of manganese content in Bar C to a small excess of sulphur content in Bar D is well illustrated by both anneals. The greater extent of black fracture in the Anneal-B bars, Nos. A, B and C, compared with the corresponding Anneal-A bars, indicates that more secondary graphitisation has occurred in the Anneal-B bars by reason of their containing the larger number of temper-carbon nodules.

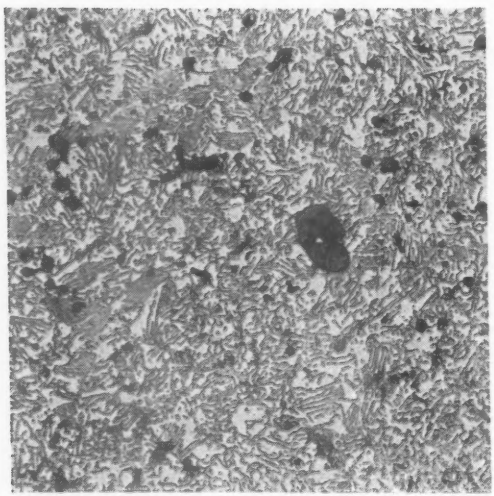
An attempt has been made in Fig. 17 to give a simple diagrammatic representation of the general conclusions to be drawn from the results of Anneals A and B on whiteheart malleable iron. Obviously, such a diagram should not be interpreted too quantitatively, but it serves to provide an over-all picture of the variation of mechanical properties, the occurrence of eutectic cementite or eutectic graphite, and the appearance of the fracture with respect to the sulphur to manganese ratio. Qualifications are made that the diagram applies to material of 0.5 to 0.6 per cent. silicon content and is intended for any section size in which de-carburisation has been insufficient to reduce the carbon content of the matrix below the eutectoid carbon content. Most whiteheart iron manufactured at the present time has a sulphur to manganese ratio of between 0.6 and 1.0. With efficient de-carburising practice, elongation values considerably in excess of those indicated for this range on the diagram can readily be obtained. When the sulphur to manganese ratio for a material exceeds 1.0, then



Anneal A.

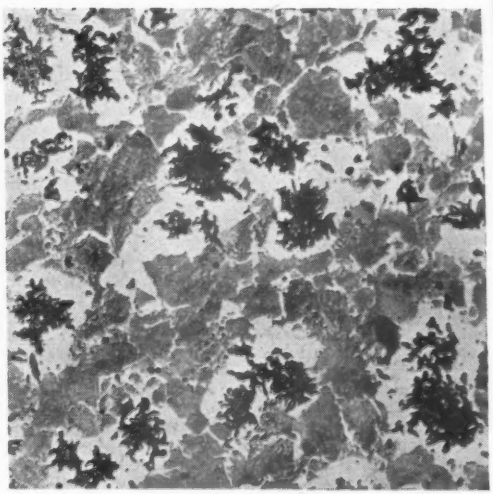


Anneal A.



Anneal B.

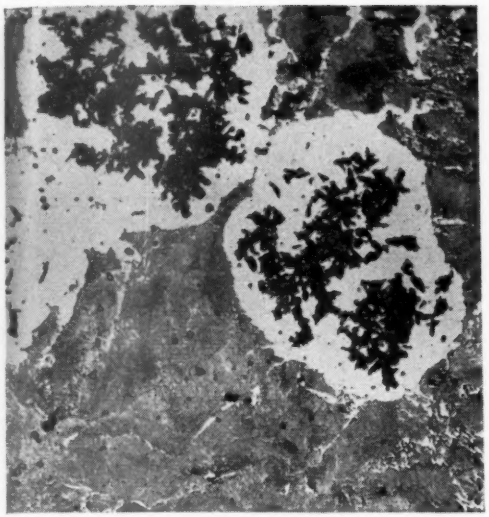
FIG. 5.—BAR NO. 2E. MANGANESE, 0.13 PER CENT. SULPHUR, 0.32 PER CENT.



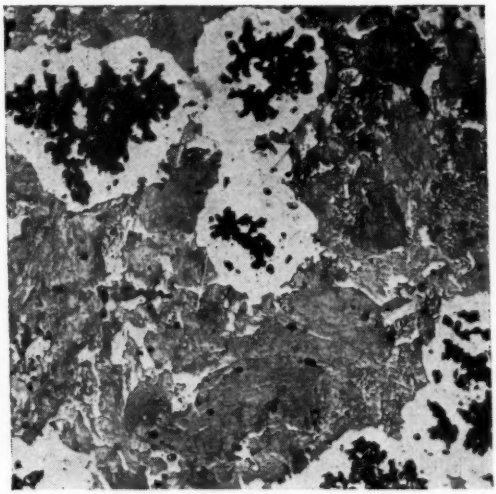
Anneal B.

FIG. 6.—BAR NO. 11A. MANGANESE, 0.34 PER CENT. SULPHUR, 0.049 PER CENT.

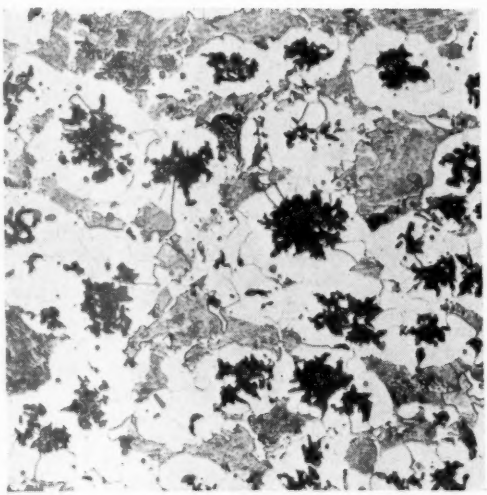
Magnification ×120. Etched in 4 per cent. Picral.



Anneal A.

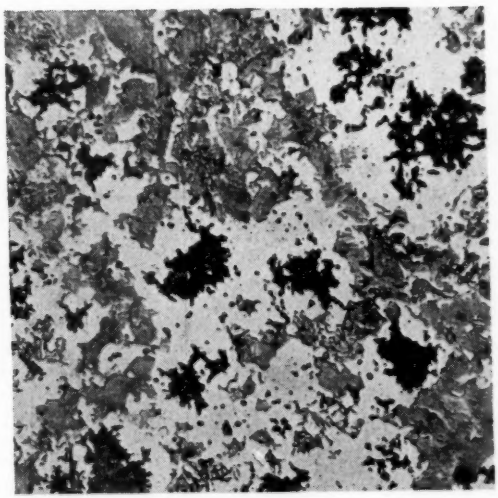


Anneal A.



Anneal B.

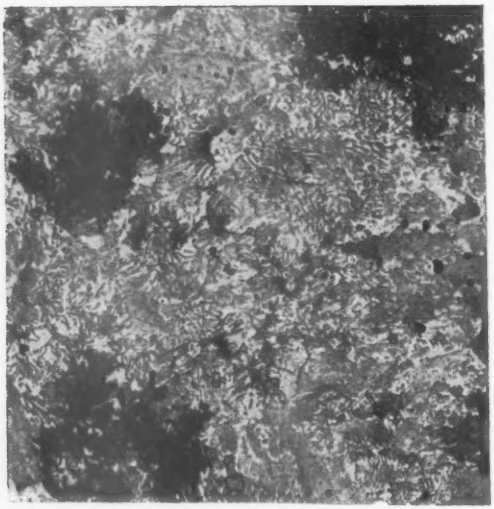
FIG. 7.—BAR NO. 11B. MANGANESE, 0.34 PER CENT. SULPHUR, 0.118 PER CENT.



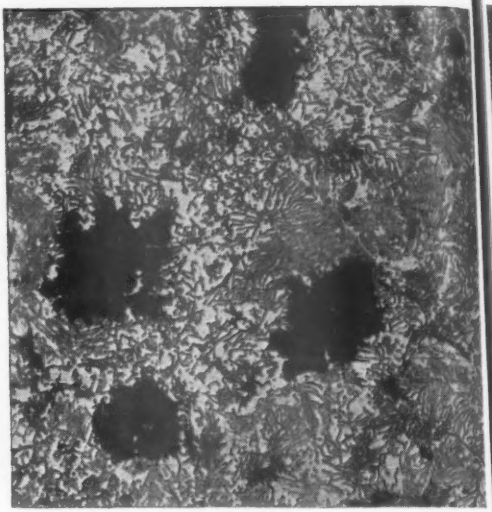
Anneal B.

FIG. 8.—BAR NO. 11C. MANGANESE, 0.34 PER CENT. SULPHUR, 0.172 PER CENT.

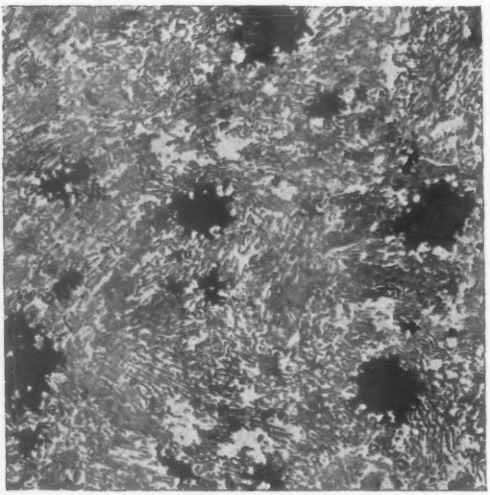
Magnification ×120. Etched in 4 per cent. Picral.



Anneal A.

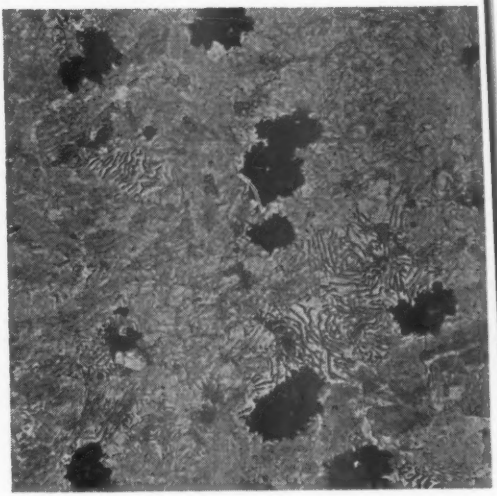


Anneal A.



Anneal B.

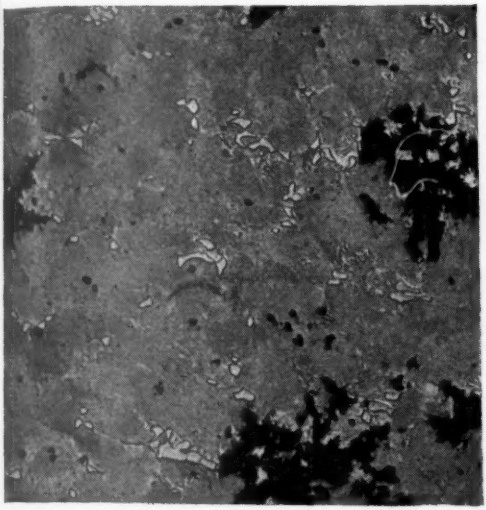
FIG. 9.—BAR NO. 11D. MANGANESE, 0.34 PER CENT. SULPHUR, 0.282 PER CENT.



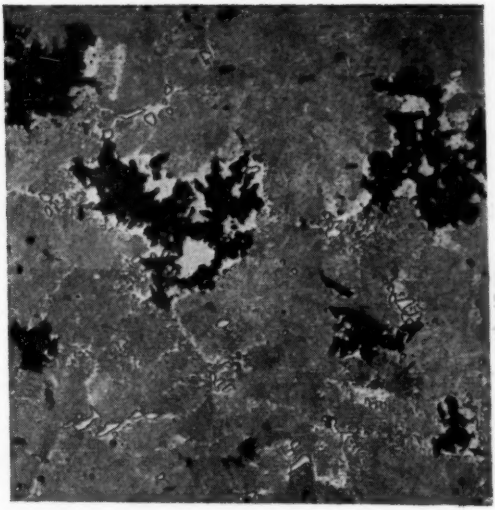
Anneal B.

FIG. 10.—BAR NO. 11E. MANGANESE, 0.34 PER CENT. SULPHUR, 0.340 PER CENT.

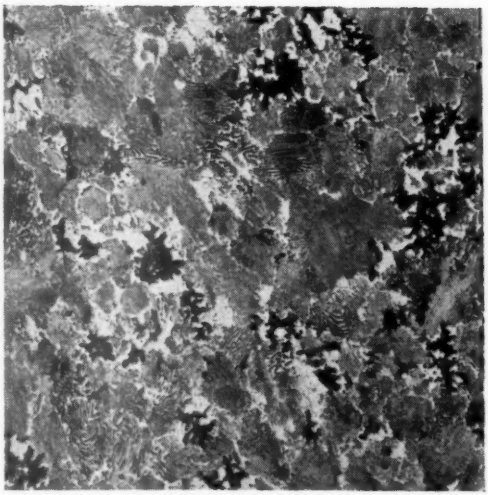
Magnification ×120. Etched in 4 per cent. Picral.



Anneal A.

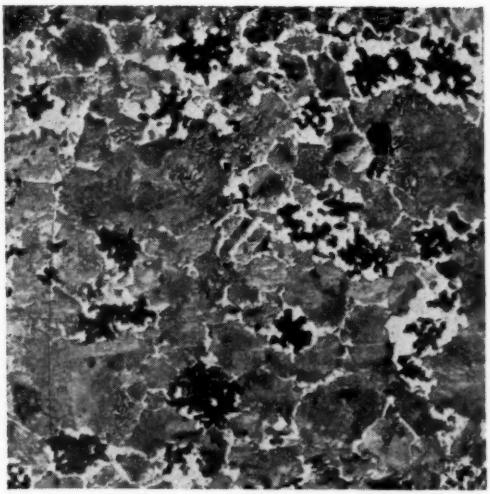


Anneal A.



Anneal B.

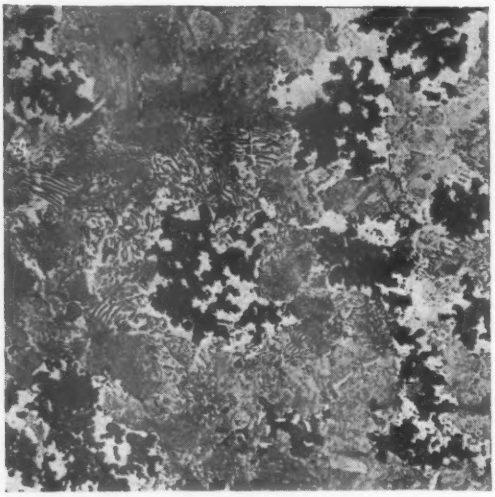
FIG. 11.—BAR NO. 17A. MANGANESE, 0.45 PER CENT. SULPHUR, 0.052 PER CENT.



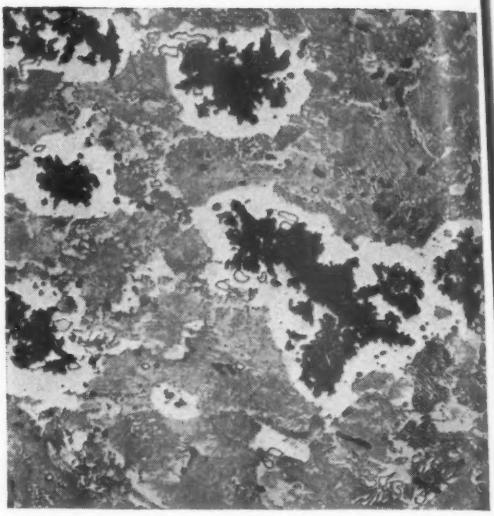
Anneal B.

FIG. 12.—BAR NO. 17B. MANGANESE, 0.45 PER CENT. SULPHUR, 0.111 PER CENT.

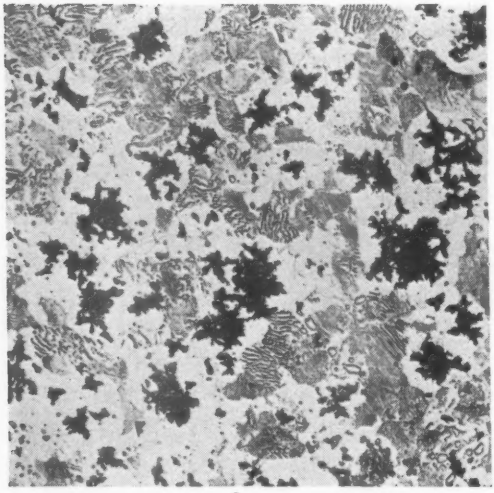
Magnification ×120. Etched in 4 per cent. Picral.



Anneal A.

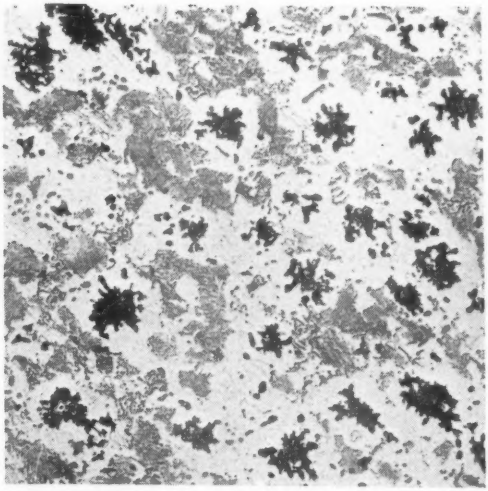


Anneal A.



Anneal B.

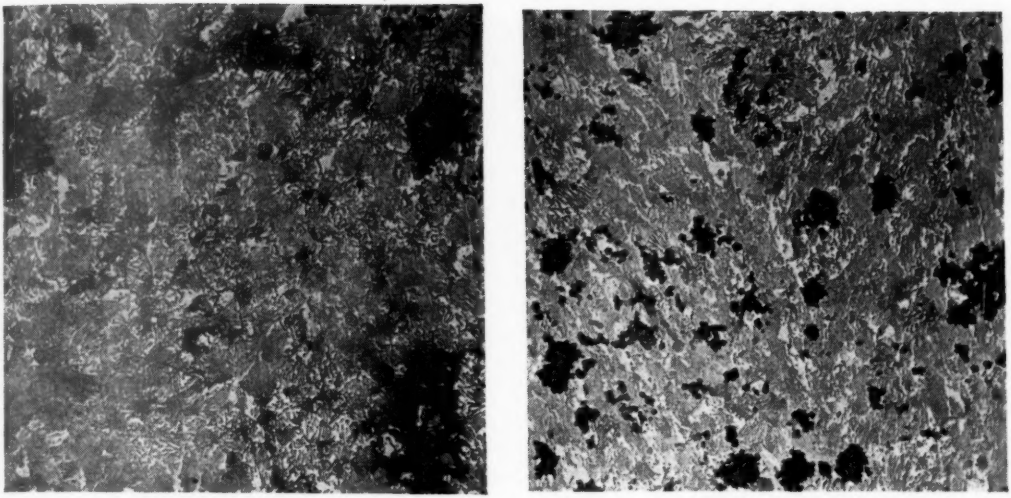
FIG. 13.—BAR NO. 17C. MANGANESE, 0.45 PER CENT. SULPHUR, 0.181 PER CENT.



Anneal B.

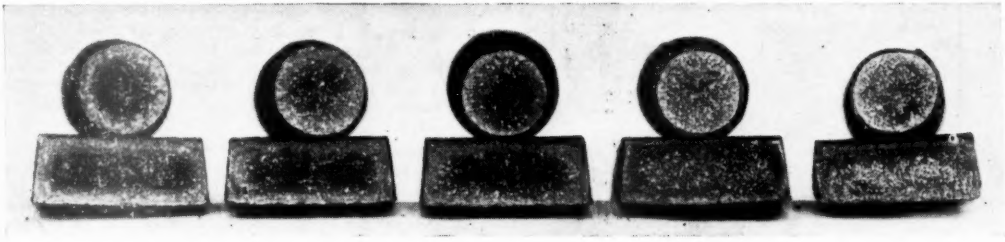
FIG. 14.—BAR NO. 17D. MANGANESE, 0.45 PER CENT. SULPHUR, 0.254 PER CENT.

Magnification ×120. Etched in 4 per cent. Picral.



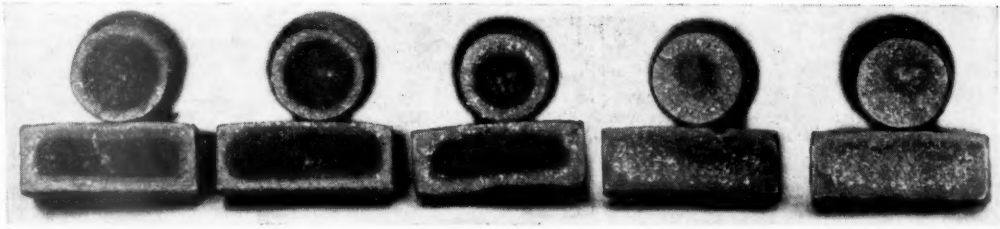
Anneal A. Anneal B.

FIG. 15.—BAR NO. 17E. MANGANESE, 0.45 PER CENT. SULPHUR, 0.310 PER CENT. Magnification ×120. Etched in 4 per cent. Picral.



Bars A B C D E

Anneal A.



Bars A B C D E

Anneal B.

FIG. 16.—FRACTURES OF TEST-BARS FROM MELT NO. 11.

Influence of Heating Rate

prolonged annealing is required and the poor mechanical properties obtained do not really justify its commercial production. Obviously, the occurrence of eutectic graphite becomes more probable with increasing section, due to a slower cooling rate at the centre of thick sections during solidification of the white iron casting.

Tensile strength has been represented in the diagram by a progressive decrease with increasing sulphur to manganese ratio. Elongation increases as a large excess manganese content is reduced to a small excess by a progressive increase in sulphur content. When a small excess sulphur content is obtained, elongation value falls sharply and then with further increases in sulphur it continues to decrease slowly. The only difference between the Anneal A and Anneal B materials indicated on this diagram is the higher elongation values obtained on the Anneal-B test-bars in the region of a small excess manganese content.

(*To be continued*)

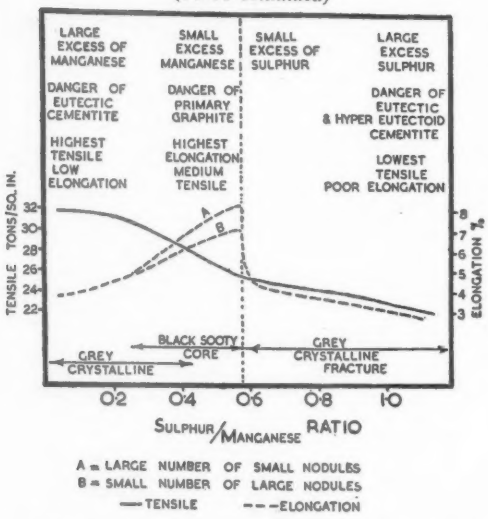


FIG. 17.—DIAGRAMMATIC REPRESENTATION OF THE RESULTS OF ANNEALS A AND B ON WHITEHEART MALLEABLE IRON.

MR. DOUGLAS CATTON, joint managing director of Catton & Company, Limited, steelfounders of Leeds, has been appointed a director of Warner & Company, Limited, Middlesbrough. MR. H. WILTON, who joined the firm in 1939 as works manager, has also been appointed a director.

Bentley Engineering's Acquisition

Bentley Engineering Company, Limited, Leicester, has acquired a majority holding of the ordinary shares of Wildt & Company, Limited, hosiery machinery manufacturers, of Leicester. It is the directors' intention, subject to the consent of the Capital Issues Committee and the necessary resolutions being passed at shareholders' meetings, to make an offer to the remaining ordinary shareholders of Wildt & Company to acquire their ordinary shares in exchange for the allotment and issue of ordinary shares in Bentley Engineering Company, Limited, on the basis of five Bentley ordinary shares of 4s. each for every four Wildt ordinary shares of 5s. each.

In the meantime, shareholders of Bentley Engineering are informed that these negotiations have delayed the calling of the company's annual meeting. Consequently, the 40 per cent. dividend recommended last month is now declared an interim dividend, although no further payment will be recommended for 1948.

A joint statement issued by the boards of the two companies last week pointed out that discussions started some months ago between Bentley Engineering and certain large shareholders and directors of Wildt & Company. When the offer was finally put before the whole Wildt board unanimous approval was not forthcoming and an announcement was made by both sides that negotiations had terminated. Subsequently, new negotiations on a fresh basis were started, as a result of which Bentley Engineering bought for cash the controlling interest in Wildt & Company at a price of 35s. a share. It was always the intention of the board of Bentley to make an offer to the remaining shareholders of Wildt & Company, and the basis is intended to be five Bentley ordinary 4s. shares for four Wildt ordinary 5s. shares.

As regards dividends, the statement went on, the Bentley board intends in future to increase the dividend on its ordinary shares from 40 per cent. to 50 per cent., so that Wildt shareholders accepting the offer will receive the same income as they are at present receiving. This offer, and the final plan, is contingent on receiving C.I.C. consent and the approval of Bentley shareholders, and the directors of both companies are of the opinion that it would not be in the interests of the ordinary shareholders of Bentley's or of Wildt's to announce the final terms and the full information which will be contained in the offer until the Capital Issues Committee's decision has been obtained.

Ready Reckoner for Cupola Charges

It is felt that the rapid method of calculating cupola charges, described on the pages immediately following, will be adopted for daily use by foundrymen. It has therefore been decided to print the "Ready Reckoner" separately on white card suitable for desk use. Copies will shortly be available, *gratis*, from the Publication Department, 49, Wellington Street, London, W.C.2.

Cupola Calculation*

Appendix to T.S. 27 Report

A Ready Reckoner for Charges

(*Continued from page* 86.)

The calculation of cupola charges is a simple matter once the procedure is understood. The following method, which uses the tables contained in the Appendix to the main Report, will probably be of interest and help to ironfounders generally. At the end of this section is printed the selected bibliography pertaining to the whole Report.

APPENDIX

Three tables, "A," "B" and "C," and a "Charge Calculation Sheet," are used. These will first be discussed separately so that each is understood thoroughly before use.

Table A.—This indicates the percentage of each element contributed to the composition of the charge. If a pig iron containing 2 per cent. silicon comprises 50 per cent. of the charge, it is obvious that this constituent will contribute 1 per cent. of silicon to the final composition. When, however, 35 per cent. of the charge consists of an iron containing 1.8 per cent. silicon, determination of the contribution made requires calculation on the following lines:—

$$X \text{ (final contribution)} \times 100 = 1.8 \times 35$$

$$\therefore X = \frac{1.8 \times 35}{100}$$

$$= 0.63 \text{ per cent. silicon.}$$

By use of Table A, however, this value can be read off as the figure found at the intersection of the vertical column headed "35 per cent." with the horizontal line reading "1.8 per cent." All values for the proportions from 5 to 80 per cent. of the charge and all contents of any element from 0.1 to 5.0 per cent. are quoted in the table and, in the manner described, any required combination is simply read off. Should the content be greater than 5 per cent., the contribution made can be derived by simple addition. For example, if the iron used to form 35 per cent. of the charge had contained 6 per cent. of silicon, the contribution would have been twice that made by a 3 per cent. silicon iron, that is, 1.05 (from the table) × 2 = 2.10 per cent. Table A therefore,

*Presented at the Annual Meeting of the Institute of British Foundrymen, at Cheltenham, by Mr. W. W. Braidwood on behalf of the Sub-committee.

Charge Calculation Sheet.

Materials used.	Metals charged, per cent.	Contribution to final composition. C.	Si.	Mn.	P.	Ni.	Mo.
Steel scrap	25	0.05	0.05	0.13	0.01	—	—
Retd. Ni-Mo cast iron scrap	30	0.90	0.60	0.24	0.06	0.45	0.15
Refined iron	25	0.75	0.55	0.30	0.10	—	—
Hematite pig	20	0.76	0.50	0.20	0.01	—	—
(10 cwt.)	100	2.46	1.70	0.87	0.18	0.45	0.15
Additions to charge :—							
Ferro-manganese, 3 lb. per charge		0.02	—	0.21	—	—	—
"F" nickel ingot, 13 lb. per charge		—	0.06	—	—	1.06	—
Ferro-molybdenum, 6 lb. per charge		—	—	—	—	—	0.37
∴ Calculated composition "as-charged"		2.48	1.76	1.08	0.18	1.51	0.52
Probable changes on melting :—							
Carbon	Gain	0.50	—	—	—	—	—
Silicon	Loss	—	−15	—	—	—	—
Manganese	Loss	—	—	−25	—	—	—
Phosphorus	Gain	—	—	—	+5	—	—
			Per cent.	Per cent.	Per cent.		
∴ Expected composition "as-tapped"		2.98	1.50	0.80	0.20	1.51	0.52
Additions to molten metal :—							
Ferro-silicon, 12 lb. per ton (75 per cent. silicon)		—	0.40	—	—	—	—
Expected final composition (in round figures)		3.0	1.90	0.8	0.2	1.5	0.5
Specified analysis		2.9 to 3.1	1.8 to 2.0	0.7 to 0.9	0.15 to 0.25	1.4 to 1.6	0.45 to 0.55

Cupola Calculation

gives at a glance the respective contributions of the main constituents of the charge, that is, those which normally are expressed as percentages of the total charge.

Table B.—This shows the contributions made by alloying materials, that is, those additional to the main charge or added to the tapped metal. These are expressed, not as percentages of the charge, but as quantities, *e.g.*:—

"10 lb. per ton of charge," or
"10 lb. per ton in the ladle."

The percentages shown at the head of the vertical columns are the proportions of alloying elements most usually encountered. For example:—

"75"—for ferro-silicon containing 75 per cent. silicon.

"80"—for ferro-manganese containing 80 per cent. manganese.

"92"—for "F" Nickel containing 92 per cent. nickel.

"100"—for additions of commercially pure materials such as nickel pellet and silicon metal.

TABLE A.—*Calculation of the Main Charge.*

Percentage of element in material used.	Percentage of element contributed to composition of charge.															
	Percentage of total charge.															
	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80
0.1		0.01	0.02	0.02	0.03	0.03	0.04	0.04	0.05	0.05	0.06	0.06	0.07	0.07	0.08	0.08
0.2	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.10	0.11	0.12	0.13	0.14	0.15	0.16
0.3		0.03	0.05	0.06	0.08	0.09	0.11	0.12	0.14	0.15	0.17	0.18	0.20	0.21	0.23	0.24
0.4	0.02	0.04	0.06	0.08	0.10	0.12	0.14	0.16	0.18	0.20	0.22	0.24	0.26	0.28	0.30	0.32
0.5		0.05	0.08	0.10	0.13	0.15	0.18	0.20	0.23	0.25	0.28	0.30	0.33	0.35	0.38	0.40
0.6	0.03	0.06	0.09	0.12	0.15	0.18	0.21	0.24	0.27	0.30	0.33	0.36	0.39	0.42	0.45	0.48
0.7		0.07	0.11	0.14	0.18	0.21	0.25	0.28	0.32	0.35	0.39	0.42	0.46	0.49	0.53	0.56
0.8	0.04	0.08	0.12	0.16	0.20	0.24	0.28	0.32	0.36	0.40	0.44	0.48	0.52	0.56	0.60	0.64
0.9		0.09	0.14	0.18	0.23	0.27	0.32	0.36	0.41	0.45	0.50	0.54	0.59	0.63	0.68	0.72
1.0	0.05	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60	0.65	0.70	0.75	0-80
1.1		0.11	0.17	0.22	0.28	0.33	0.39	0.44	0.50	0.55	0.61	0.66	0.72	0.77	0.83	0.88
1.2	0.06	0.12	0.18	0.24	0.30	0.36	0.42	0.48	0.54	0.60	0.66	0.72	0.78	0.84	0.90	0.96
1.3		0.13	0.20	0.26	0.33	0.39	0.46	0.52	0.59	0.65	0.72	0.78	0.85	0.91	0.98	1.04
1.4	0.07	0.14	0.21	0.28	0.35	0.42	0.49	0.56	0.63	0.70	0.77	0.84	0.91	0.98	1.05	1.12
1.5		0.15	0.23	0.30	0.38	0.45	0.53	0.60	0.68	0.75	0.83	0.90	0.98	1.05	1.13	1.20
1.6	0.08	0.16	0.24	0.32	0.40	0.48	0.56	0.64	0.72	0.80	0.88	0.96	1.04	1.12	1.20	1.28
1.7		0.17	0.26	0.34	0.43	0.51	0.60	0.68	0.77	0.85	0.94	1.02	1.11	1.19	1.28	1.36
1.8	0.09	0.18	0.27	0.36	0.45	0.54	0.63	0.72	0.81	0.90	0.99	1.08	1.17	1.26	1.35	1.55
1.9		0.19	0.29	0.38	0.48	0.57	0.67	0.76	0.86	0.95	1.05	1.14	1.24	1.33	1.43	1.52
2.0	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30	1.40	1.50	1.60
2.1		0.21	0.32	0.42	0.53	0.63	0.74	0.84	0.95	1.05	1.16	1.26	1.37	1.47	1.58	1.68
2.2	0.11	0.22	0.33	0.44	0.55	0.66	0.77	0.88	0.99	1.10	1.21	1.32	1.43	1.54	1.65	1.76
2.3		0.23	0.35	0.46	0.58	0.69	0.81	0.92	1.04	1.15	1.27	1.38	1.50	1.61	1.73	1.84
2.4	0.12	0.24	0.36	0.48	0.60	0.72	0.84	0.96	1.08	1.20	1.32	1.44	1.56	1.68	1.80	1.92
2.5		0.25	0.38	0.50	0.63	0.75	0.88	1.00	1.13	1.25	1.38	1.50	1.63	1.75	1.88	2.00
2.6	0.13	0.26	0.39	0.52	0.65	0.78	0.91	1.04	1.17	1.30	1.43	1.56	1.69	1.82	1.95	2.08
2.7		0.27	0.41	0.54	0.68	0.81	0.95	1.08	1.22	1.35	1.49	1.62	1.76	1.89	2.03	2.16
2.8	0.14	0.28	0.42	0.56	0.70	0.84	0.98	1.12	1.26	1.40	1.54	1.68	1.82	1.96	2.10	2.24
2.9		0.29	0.44	0.58	0.73	0.87	1.02	1.16	1.31	1.45	1.60	1.74	1.89	2.03	2.18	2.32
3.0	0.15	0.30	0.45	0.60	0.75	0.90	1.05	1.20	1.35	1.50	1.65	1.80	1.95	2.10	2.25	2.40
3.1		0.31	0.47	0.62	0.78	0.93	1.09	1.24	1.40	1.55	1.71	1.86	2.02	2.17	2.33	2.48
3.2	0.16	0.32	0.48	0.64	0.80	0.96	1.12	1.28	1.44	1.60	1.76	1.92	2.08	2.24	2.40	2.56
3.3		0.33	0.49	0.66	0.83	0.99	1.16	1.32	1.49	1.65	1.82	1.98	2.15	2.31	2.48	2.64
3.4	0.17	0.34	0.51	0.68	0.85	1.02	1.19	1.36	1.53	1.70	1.87	2.04	2.21	2.38	2.55	2.72
3.5		0.35	0.53	0.70	0.88	1.05	1.23	1.40	1.58	1.75	1.93	2.10	2.28	2.45	2.63	2.80
3.6	0.18	0.36	0.54	0.72	0.90	1.08	1.26	1.44	1.62	1.80	1.98	2.16	2.34	2.52	2.70	2.88
3.7		0.37	0.56	0.74	0.93	1.11	1.30	1.48	1.67	1.85	2.04	2.22	2.41	2.59	2.78	2.96
3.8	0.19	0.38	0.57	0.76	0.95	1.14	1.33	1.52	1.71	1.90	2.09	2.28	2.47	2.66	2.85	3.04
3.9		0.39	0.59	0.78	0.98	1.17	1.37	1.56	1.76	1.95	2.15	2.34	2.54	2.73	2.93	3.12
4.0	0.20	0.40	0.60	0.80	1.00	1.20	1.40	1.60	1.80	2.00	2.20	2.40	2.60	2.80	3.00	3.20
4.1		0.41	0.62	0.82	1.03	1.23	1.44	1.64	1.85	2.05	2.26	2.46	2.67	2.87	3.08	3.28
4.2	0.21	0.42	0.63	0.84	1.05	1.26	1.47	1.68	1.89	2.10	2.31	2.52	2.73	2.94	3.15	3.36
4.3		0.43	0.65	0.86	1.08	1.29	1.51	1.72	1.94	2.15	2.37	2.58	2.80	3.01	3.23	3.44
4.4	0.22	0.44	0.66	0.88	1.10	1.32	1.54	1.76	1.98	2.20	2.42	2.64	2.86	3.08	3.30	3.52
4.5		0.45	0.68	0.90	1.13	1.35	1.58	1.80	2.03	2.25	2.48	2.70	2.93	3.15	3.38	3 60
4.6	0.23	0.46	0.69	0.92	1.15	1.38	1.61	1.84	2.07	2.30	2.53	2.76	2.99	3.22	3.45	3.68
4.7		0.47	0.71	0.94	1.18	1.41	1.65	1.88	2.12	2.35	2.59	2.82	3.06	3.29	3.53	3.76
4.8	0.24	0.48	0.72	0.96	1.20	1.44	1.68	1.92	2.16	2.40	2.64	2.88	3.12	3.36	3.60	3.84
4.9		0.49	0.74	0.98	1.23	1.47	1.72	1.96	2.21	2.45	2.70	2.94	3.19	3.43	3.68	3.92
5.0	0.25	0.50	0.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00

Suppose, for example, that it is desired to add 0.40 per cent. silicon and that ferro-silicon containing 75 per cent. silicon is available. Using Table B we read down the column headed "75 per cent." till we reach the value 0.40. Reading across to the left from this figure indicates the required addition to be 12 lb. per ton.

Table C.—This is used for determining the allowances required for loss or gain in melting. The vertical columns give "Losses" from 50 to 5 per cent., in steps of 5 per cent., with "Gains" of 2½ and 5 per cent., and the Table shows the content required in the charge to ensure the desired content at the spout. Suppose that one wishes to tap metal containing 1.5 per cent. silicon. The charges contain 25 per cent. of steel and a loss is expected of 15 per cent. of the silicon charged. One looks down the extreme left-hand column headed "Percentage of Element desired at Spout" to the figure 1.5, and then reads across until one is under the column headed "Loss 15 per cent." At the intersection the value 1.76 per cent. is found. This is the silicon content which must be present in the charge if 1.5 per cent. silicon is to be obtained in the molten metal after a 15 per cent. loss in melting.

Charge Calculation Sheet.—In computing a charge the use of a standard sheet of the type illustrated is helpful.

TABLE B.—*Calculation of Increments from Alloying Materials.*

Lb. of alloying material per ton.	Percentage increase of added elements. Percentage of element present in alloying material.										
	40	45	50	60	65	70	75	80	85	92	100
1	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.04	0.04	0.04	0.04
2	0.04	0.04	0.04	0.05	0.06	0.06	0.07	0.07	0.08	0.08	0.08
3	0.05	0.06	0.07	0.08	0.09	0.09	0.10	0.11	0.11	0.12	0.13
4	0.07	0.08	0.09	0.11	0.12	0.12	0.13	0.14	0.15	0.16	0.17
5	0.09	0.10	0.11	0.13	0.14	0.16	0.17	0.18	0.19	0.20	0.22
6	0.11	0.12	0.13	0.16	0.17	0.19	0.20	0.21	0.23	0.25	0.26
7	0.13	0.14	0.15	0.19	0.20	0.22	0.23	0.23	0.26	0.29	0.30
8	0.14	0.16	0.18	0.21	0.23	0.25	0.27	0.28	0.30	0.33	0.35
9	0.16	0.18	0.20	0.24	0.26	0.28	0.30	0.32	0.34	0.37	0.39
10	0.18	0.20	0.22	0.27	0.29	0.31	0.33	0.36	0.38	0.41	0.44
11	0.20	0.22	0.24	0.29	0.32	0.34	0.37	0.39	0.42	0.45	0.49
12	0.21	0.24	0.26	0.32	0.35	0.37	0.40	0.43	0.45	0.49	0.53
13	0.23	0.26	0.29	0.35	0.37	0.40	0.43	0.46	0.49	0.53	0.58
14	0.25	0.28	0.31	0.37	0.40	0.44	0.47	0.50	0.53	0.57	0.62
15	0.27	0.30	0.33	0.40	0.43	0.47	0.50	0.53	0.56	0.61	0.66
16	0.28	0.32	0.36	0.43	0.46	0.50	0.53	0.57	0.60	0.65	0.71
17	0.30	0.34	0.38	0.45	0.49	0.53	0.57	0.60	0.64	0.69	0.75
18	0.32	0.36	0.40	0.48	0.52	0.56	0.60	0.64	0.68	0.73	0.80
19	0.34	0.38	0.42	0.51	0.55	0.59	0.63	0.67	0.71	0.77	0.84
20	0.36	0.40	0.44	0.53	0.58	0.62	0.67	0.71	0.75	0.81	0.89
21	0.38	0.42	0.46	0.56	0.60	0.65	0.70	0.74	0.79	0.85	0.93
22	0.39	0.44	0.48	0.58	0.63	0.68	0.73	0.78	0.83	0.89	0.97
23	0.41	0.46	0.50	0.61	0.66	0.71	0.76	0.81	0.86	0.93	1.02
24	0.43	0.48	0.53	0.64	0.69	0.74	0.80	0.85	0.90	0.98	1.06
25	0.45	0.50	0.55	0.66	0.72	0.77	0.83	0.88	0.94	1.02	1.10
26	0.46	0.52	0.57	0.69	0.75	0.80	0.86	0.92	0.97	1.06	1.15
27	0.48	0.54	0.59	0.71	0.77	0.83	0.89	0.95	1.01	1.10	1.19
28	0.50	0.56	0.62	0.74	0.80	0.86	0.93	0.99	1.05	1.14	1.23
29	0.52	0.58	0.64	0.77	0.83	0.89	0.96	1.02	1.09	1.18	1.28
30	0.53	0.59	0.66	0.79	0.86	0.93	0.99	1.06	1.12	1.22	1.32
31	0.55	0.61	0.68	0.82	0.89	0.96	1.02	1.09	1.16	1.26	1.37
32	0.56	0.63	0.71	0.85	0.91	0.99	1.06	1.13	1.20	1.30	1.41
33	0.58	0.65	0.73	0.87	0.94	1.02	1.09	1.16	1.23	1.34	1.45
34	0.60	0.67	0.75	0.90	0.97	1.04	1.12	1.20	1.27	1.38	1.50
35	0.62	0.69	0.77	0.92	1.00	1.07	1.15	1.23	1.31	1.41	1.54
36	0.63	0.71	0.79	0.95	1.03	1.10	1.19	1.26	1.34	1.45	1.58
37	0.65	0.73	0.82	0.98	1.06	1.13	1.22	1.30	1.38	1.49	1.63
38	0.67	0.75	0.84	1.00	1.08	1.16	1.25	1.33	1.42	1.53	1.67
39	0.69	0.77	0.86	1.03	1.11	1.19	1.28	1.37	1.45	1.57	1.72
40	0.70	0.79	0.88	1.05	1.14	1.23	1.32	1.40	1.49	1.61	1.75
41	0.72	0.81	0.90	1.08	1.17	1.25	1.35	1.43	1.53	1.65	1.80
42	0.74	0.83	0.92	1.10	1.20	1.28	1.38	1.47	1.56	1.69	1.84
43	0.75	0.85	0.94	1.13	1.22	1.31	1.41	1.51	1.60	1.73	1.89
44	0.77	0.87	0.97	1.16	1.25	1.34	1.44	1.54	1.64	1.77	1.93
45	0.79	0.89	0.99	1.18	1.28	1.37	1.48	1.58	1.67	1.81	1.97
46	0.81	0.91	1.01	1.21	1.31	1.40	1.51	1.61	1.71	1.85	2.02
47	0.82	0.92	1.03	1.23	1.34	1.43	1.54	1.64	1.75	1.80	2.06
48	0.84	0.94	1.05	1.26	1.36	1.46	1.57	1.68	1.78	1.93	2.10
49	0.86	0.96	1.07	1.28	1.39	1.49	1.61	1.71	1.82	1.97	2.15
50	0.87	0.98	1.09	1.30	1.42	1.53	1.64	1.75	1.86	2.01	2.19

Cupola Calculation

Illustration of Method

The practical operation of all the Tables can best be illustrated by working out a charge. The example quoted, a fairly complex case, has been chosen as being comprehensive. Let is be assumed that there are available the following materials:—

	C.	Si.	Mn.	P.	Ni.	Mo.
Hematite pig-iron ..	3.8	2.5	1.0	0.05	—	—
Refined iron	3.0	2.2	1.2	0.40	—	—
Steel scrap	0.2	0.2	0.5	0.05	—	—
High duty cast-iron scrap	3.0	2.0	0.8	—	1.5	0.5
Ferro-silicon	—	75.0	—	—	—	—
Ferro-manganese ..	6.0	—	80.0	—	—	—
Ferro-molybdenum ..	—	—	—	—	—	70
"F" nickel ingot ..	—	5.0	—	—	92	—

Let is also be assumed that the production of a Grade 23 iron is needed to the following percentage composition:—C, 2.9 to 3.1; Si (including a ladle increment of 0.40 per cent. silicon), 1.8 to 2.0; Mn, 0.7 to 0.9; P, 0.15 to 0.25; Ni, 1.4 to 1.6, and Mo, 0.45 to 0.55. The cupola is 42 in. diameter and the unit charges are 10 cwt. each.

One must first decide the proportions of steel scrap to use in the charge. Since refined iron is available one would probably choose to use 25 per cent. of steel (see Table III of the Report). On the charge calculation sheet one can therefore make the first entry:—

"Steel Scrap 25 per cent.,"

and then read off from Table A, under the 25 per cent. column, the contributions for carbon, silicon, manganese and phosphorus shown in the first line of the completed sheet.

TABLE C.—*Adjustment for Losses and Gains in Melting.*

Percentage of element desired at spout.	Percentage of element required in cupola charge. Expected. Loss (per cent.). 50	45	40	35	30	25	20	15	10	5	Gain (per cent.). 2½	5
0.05	0.10	0.09	0.08	0.08	0.07	0.07	0.06	0.06	0.06	0.05	0.05	0.05
0.10	0.20	0.18	0.17	0.15	0.14	0.13	0.13	0.12	0.11	0.11	0.10	0.10
0.15	0.30	0.27	0.25	0.23	0.21	0.20	0.19	0.18	0.17	0.16	0.15	0.14
0.20	0.40	0.36	0.33	0.31	0.29	0.27	0.25	0.24	0.22	0.21	0.20	0.19
0.25	0.50	0.45	0.42	0.38	0.36	0.34	0.31	0.29	0.28	0.26	0.24	0.24
0.30	0.60	0.55	0.50	0.46	0.43	0.40	0.38	0.35	0.33	0.32	0.29	0.29
0.35	0.70	0.64	0.58	0.54	0.50	0.47	0.44	0.41	0.39	0.36	0.34	0.33
0.40	0.80	0.73	0.67	0.62	0.57	0.53	0.50	0.47	0.44	0.42	0.39	0.38
0.45	0.90	0.82	0.76	0.69	0.64	0.50	0.56	0.53	0.50	0.47	0.44	0.43
0.50	1.00	0.91	0.83	0.77	0.71	0.67	0.63	0.59	0.56	0.53	0.49	0.48
0.55	1.10	1.00	0.92	0.85	0.79	0.74	0.69	0.64	0.61	0.58	0.54	0.52
0.60	1.20	1.09	1.00	0.92	0.86	0.80	0.75	0.71	0.67	0.63	0.59	0.57
0.65	1.30	1.18	1.08	1.00	0.93	0.87	0.81	0.76	0.72	0.68	0.63	0.62
0.70	1.40	1.27	1.17	1.08	1.00	0.93	0.88	0.82	0.78	0.74	0.68	0.67
0.75	1.50	1.36	1.25	1.15	1.07	1.00	0.94	0.88	0.83	0.79	0.73	0.71
0.80	1.60	1.45	1.33	1.23	1.14	1.07	1.00	0.94	0.89	0.84	0.78	0.76
0.85	1.70	1.55	1.42	1.31	1.21	1.14	1.06	1.00	0.94	0.89	0.83	0.81
0.90	1.80	1.64	1.50	1.38	1.29	1.20	1.13	1.06	1.00	0.95	0.88	0.86
0.95	1.90	1.73	1.58	1.46	1.36	1.27	1.19	1.12	1.06	1.00	0.93	0.90
1.00	2.00	1.82	1.67	1.54	1.43	1.33	1.25	1.18	1.11	1.05	0.98	0.95
1.1	2.20	2.00	1.83	1.69	1.57	1.47	1.38	1.29	1.22	1.16	1.07	1.05
1.2	2.40	2.18	2.00	1.85	1.71	1.60	1.50	1.41	1.33	1.26	1.17	1.14
1.3	2.60	2.36	2.17	2.00	1.86	1.73	1.63	1.53	1.44	1.36	1.27	1.24
1.4	2.80	2.55	2.33	2.15	2.00	1.87	1.75	1.64	1.56	1.47	1.37	1.33
1.5	3.00	2.73	2.50	2.31	2.14	2.00	1.88	1.76	1.67	1.58	1.40	1.43
1.6	3.20	2.91	2.67	2.46	2.29	2.13	2.00	1.88	1.78	1.68	1.56	1.52
1.7	3.40	3.09	2.83	2.62	2.43	2.27	2.13	2.00	1.89	1.79	1.66	1.62
1.8	3.60	3.27	3.00	2.77	2.57	2.40	2.25	2.12	2.00	1.89	1.76	1.71
1.9	3.80	3.45	3.17	2.92	2.71	2.53	2.38	2.24	2.11	2.00	1.85	1.81
2.0	4.00	3.64	3.33	3.08	2.86	2.67	2.50	2.35	2.22	2.11	1.95	1.90
2.1	4.20	3.82	3.50	3.23	3.00	2.80	2.63	2.47	2.33	2.21	2.05	2.00
2.2	4.40	4.00	3.67	3.38	3.14	2.93	2.75	2.59	2.44	2.32	2.15	2.10
2.3	4.60	4.18	3.83	3.54	3.29	3.07	2.88	2.71	2.56	2.42	2.24	2.18
2.4	4.80	4.36	4.00	3.69	3.43	3.20	3.00	2.82	2.67	2.53	2.34	2.29
2.5	5.00	4.55	4.17	3.85	3.57	3.33	3.13	2.94	2.78	2.63	2.44	2.38
2.6	5.20	4.73	4.33	4.00	3.71	3.47	3.25	3.06	2.89	2.74	2.54	2.48
2.7	5.40	4.91	4.50	4.15	3.86	3.60	3.38	3.18	3.00	2.84	2.63	2.57
2.8	5.60	5.09	4.67	4.31	4.00	3.73	3.50	3.29	3.11	2.95	2.73	2.67
2.9	5.80	5.27	4.83	4.46	4.14	3.87	3.63	3.41	3.22	3.05	2.83	2.76
3.0	6.00	5.45	5.00	4.62	4.20	4.00	3.75	3.53	3.33	3.16	2.93	2.86
3.1	6.20	5.64	5.17	4.77	4.43	4.13	3.88	3.64	3.44	3.26	3.02	2.95
3.2	6.40	5.82	5.33	4.92	4.57	4.27	4.00	3.76	3.56	3.36	3.12	3.05
3.3	6.60	6.00	5.50	5.08	4.71	4.40	4.13	3.88	3.67	3.47	3.22	3.14
3.4	6.80	6.18	5.67	5.23	4.86	4.53	4.25	4.00	3.78	3.58	3.32	3.24
3.5	7·00	6.36	5.83	5.38	5.00	4.67	4.38	4.12	3.89	3.68	3.41	3.33
3.6	7.20	6.55	6.00	5.54	5.14	4.80	4.50	4.24	4.00	3.79	3.51	3.43
3.7	7.40	6.73	6.17	5.69	5.29	4.93	4.63	4.35	4.11	3.89	3.61	3.52
3.8	7.60	6.91	6.33	5.85	5.43	5.07	4.75	4.47	4.22	4.00	3.71	3.62
3.9	7.80	7.09	6.50	6.00	5.57	5.20	4.88	4.59	4.33	4.11	3.80	3.71
4.0	8.00	7.27	6.67	6.15	5.71	5.33	5.00	4.71	4.44	4.21	3.90	3.81

There will normally be available about 30 per cent. of returned high-duty cast-iron scrap of the composition shown. The second entry on the sheet may thus be made and the values entered.

The materials for the remaining 45 per cent. of the charge have still to be allocated and there are available two pig irons. The preferred final phosphorus content is 0.20 per cent. and the phosphorus requirement is an important factor in determining the respective proportions of these pig irons. The phosphorus column on the charge sheet already shows a total of 0.07 per cent. The phosphorus contribution from the hematite pig will be slight and one can provide say 0.1 per cent. of phosphorus from the refined iron which contains 0.40 per cent. of this element. Reading across from 0.4 per cent in the left-hand column of Table A one finds that 0.1 per cent. would be contributed if the refined iron comprised 25 per cent. of the charge. Therefore, the third and fourth entries can be made on the sheet.

At this stage it is best to make a preliminary total for each element. This completes calculation of the main charge. Since it is required to add 0.4 per cent. silicon at the spout and the alloy additions are moderately heavy it will be of advantage to incorporate the nickel and molybdenum in the charge, together with any silicon or manganese which may be needed. The main elements must now be considered separately, as follows:—

Silicon.—The silicon in the charge totals 1.70 per cent. which, after the expected loss of 15 per cent., will give only slightly less than the 1.5 per cent. silicon desired in the tapped metal, and since it is known that subsequent addition of "F" nickel will contribute a small amount of silicon, no adjustment is necessary.

Manganese.—The final figure is to be about 0.8 per cent. and the expected loss on melting is 25 per cent. Table C shows that the charged content should be 1.07 per cent. As the present total is 0.87 per cent. one needs 0.20 per cent. additional manganese. Table B shows that 0.21 per cent. will be contributed by addition of ferro-manganese in the proportions of 6 lb. per ton, that is, 3 lb. per 10 cwt. unit charge, and this entry is made. Ferro-manganese contains 6 per cent. carbon. Table B has no column headed "6 per cent.," but one can read under "60 per cent." and divide the value by ten. This gives 0.016, say, 0.02, which is entered for carbon.

Nickel.—This element suffers no loss by oxidation. Thus it is necessary simply to increase the content of the charge from 0.45 to 1.50 per cent., that is, by 1.05 per cent. nickel. On Table B one reads down the column headed "92 per cent." until the figure of 1.05 per cent. or nearest is reached, then across to the left-hand column to read off "26 lb. per ton," which represents 13 lb. per unit charge and this is entered. "F" nickel contains about 5 per cent. silicon and, as already explained, the figure for 50 per cent. can be read and the result divided by 10, giving 0.06 per cent. to be entered for silicon.

Molybdenum.—In this case also there is no appreciable loss in melting. It is necessary to increase molybdenum by 0.35 per cent. Reading Table B under "70" one finds that 0.37 per cent. is contributed by addition of 12 lb. per ton of ferro-molybdenum, that is 6 lb. per unit charge. This further entry is made.

The "Calculated Composition as-charged" should now be totalled, before dealing with the changes on melting, which are reckoned as follows:—Insert the expected gains and losses on the sheet. Then by addition in the case of carbon, and by use of Table C for the other elements, the figures shown for "Expected Composition as-tapped," can be inserted.

It remains only to derive the addition needed to give an increment of 0.4 per cent. silicon to the molten metal. Table B shows that, using ferro-silicon containing 75 per cent. silicon, the required proportion is 12 lb. per ton of metal tapped. This amount is entered and the expected final composition expressed in round figures all as shown in the completed sheet.

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Contract Open

The dates given are the latest on which tenders will be accepted. The addresses are those from which forms of tender may be obtained. Details of tenders with the reference E.P.D. or C.R.E. can be obtained from the Commercial Relations and Exports Department, Board of Trade, Thames House North, Millbank, London, S.W.1.

STOKE-ON-TRENT, August 9—Cast-iron pipes and specials, etc., for the Corporation. The City Surveyor, Town Hall, Stoke-on-Trent.

AS FROM NEXT MONTH the Journal of Research and Development, hitherto a confidential publication issued by the British Cast Iron Research Association to members only, will be published on a subscription basis.

Making the Foundry More Attractive*

Trends of Opinion Amongst Scottish Foundrymen

Compiled by R. O. Patterson

(*Continued from page* 90.)

Training Methods

Several writers have dealt at some length with the subject of improved training methods. Many of their suggestions agree one with another, and are fairly well represented in outline by the following general description by one Author:—

"The application of various studies and exercises must be made clear to the apprentice and his interest must be stimulated by regarding the sum or exercise as a real, practical problem and not as an abstract calculation or a form of mental gymnastics completely divorced from his daily work in the moulding shop. Sound theoretical reasoning must be linked to the practical work of an apprentice. Enthusiasm could perhaps be stimulated by showing him how the greatest of engineering feats which have benefited all mankind depended on the solid sound foundation of good, honest craftsmanship, which resulted in strong, perfect castings. Visits to paper mills, power stations, water schemes and railway shops could be arranged, and the importance to these industries of sound castings emphasised. Reasons for the different types of moulds such as loam, dry-sand and green-sand, should be explained and the different methods compared. Theoretical ideas on sand testing should be reasoned out with rough comparisons and practical tests. Composition, construction and types of moulds should be studied, especially where difficulties are encountered.

Admitting Failure

"Failures should be honestly admitted—and reasons for these deduced—the goal being a steady production of sound castings with a minimum of effort and risk. The whole scope of moulding work should be reviewed and all the methods in use explained.

"Instruction of this kind is not available to apprentices, as a rule, but a rapid survey of the whole scope of foundry work in a general way would make the details of his own work far more interesting. A very comprehensive review could be put forward in the form of a film or films with an oral description of the processes in very much the same manner as a news reel. Attention should be given to the scrap or defective castings and, by means of visual examination or breaking up, the reasons for defects and the extent of them should be laid bare and explained to the apprentice. Very little of this study is available to the ordinary evening- or continuation-class student, as it is too specialised."

Another paper states:—

"The training should entail all forms of core-making and moulding. There should be a small laboratory where trainees could be shown how to carry out the every-day sand tests for permeability and moisture, be taught the necessity for using various types of sand for different types of work, and how to mix and mill their own sand, whether for cores or moulds; a good sand is the first necessity in making a good mould. A moulder should know more about the properties of the sand with which he works than does the average moulder to-day.

"It is suggested that the most difficult and intricate patterns and core boxes should be used, such as those involving slip-joints and draw-backs. In fact, every means should be adopted to make each job as difficult as possible; bedding work in the floor could be introduced at a later stage. Nothing discourages a lad more than giving him a plain job and keeping him at that for a period of weeks; the management might obtain a few more castings that way, but this subject should be examined with the idea of obtaining the best possible moulders at the end of such training, even at the expense of finding scrapped castings. The important thing is for the trainee to learn the causes of each bad casting he makes, and for the instructor to make sure the lad has thoroughly grasped the reason why such a casting is scrapped."

The Core Shop

One competitor wrote:—

"The core shop is usually the place where the seeds of like or dislike for a recruit are sown. There can be many monotonies to discourage interest; for instance, continuous repetition of simple core-making, or working too long with a tradesman without having the personal responsibility and satisfaction of completing a core. In fact, too long spent in the core shop, although proving the proficiency of an apprentice (it is usually why he is retained there), develops the tendency towards loss of interest, especially if the lad has no knowledge of what the cores are for. This applies to every section of the shop from moulding to closing.

"It is suggested that the apprenticeship could be split into two sections. The first half would consist of a quick tour around the whole system from core making to moulding, closing and casting, stopping only long

* Report compiled to embody the best suggestions from all Papers in a Competition organised by the Scottish Branch of the Institute of British Foundrymen.

Making the Foundry More Attractive

enough in each section to get an idea of what is being done. This should give the apprentice a basic and fundamental idea of the practice of that particular foundry. The more detailed acquisition of knowledge would be obtained in the second half of the apprenticeship.

"At the end of the first half, a selected number of youths could be coached for an executive position. One at a time, for a period of one year, they could be taken under the wing of the foundry manager and transferred to his office and allowed to become acquainted with the system of running the foundry, including the drawing office, planning of pattern design, plant processes and methods, estimating of casting weights, time studies, and progress and despatch methods. The success of this scheme was adequately described by Mr. J. G. Arnott in his Paper entitled 'Apprentices and Foundry Planning,' presented to the Institute of British Foundrymen, Scottish Branch, on January 11, 1941. After that executive-coaching year the apprentice would return to the shop to finish his time."

Incentive

"Incentive by bonus is often considered harmful, but I have yet to hear an apprentice say that. An extra shilling or two can be very encouraging. Remuneration for a job makes the trainee think out for himself faster and more efficient ways of making that job so as to cut out needless work. If the work is hurried and not done properly, the result is evident in the finished casting and no foreman would let anyone get away with such work. But prices should be set as an encouragement and not with an eye to cheap production. Individual job pricing is by far the best and can be applied to all sections, including core-making. The method of verbal recommendation, by a foreman or chargehand, for the increasing of an apprentice's time rate is not satisfactory as it breeds jealousy and alleged favouritism, but this is not so evident if the award is made from evening-class or training school results. The fact that wages are higher in non-trade occupations deters many youths from entering the trade, but if their wages as an apprentice were to be made equivalent, or nearly so, by means of an incentive bonus, then it would give definite encouragement.

Education

"The value of technical education, theoretical and practical, cannot be overemphasised. Unlike in the services, it is impractical to send each apprentice on an intensive course, but by planned practical day-training in the foundry, and theoretical evening-class work, the same object could be obtained.

"Not every firm can boast of a training school, but it is possible to have lectures and discussions periodically, say weekly, on subjects such as problems and methods of shop practice, metals and sands, fettling, pattern-making, progress and even on rate-fixing, given by a competent executive from each department. Pattern-making apprentices could also join in these discussions.

"Technical literature should be available and made easily accessible for reference. Trade magazines can be circulated, a list of names being gummed to the front cover and each recipient might take the magazine home for three days, placing his signature on it and then handing it on to the next person on the list. Where the circulation covers a number of persons, a series of copies could be sent around, the last recipients returning them to the library for filing. Copies of all literature, other than magazines, and including bound books, could be kept in the library or in the foreman's office, to be loaned out on being signed for.

"Films, of course, are quite a different question, but the value of them is immense, especially the diagrammatic types. This style of film could easily be applied to foundrywork, such as, for example, in showing the diagrammatic behaviour of metal entering a mould or the assumed reaction of a charge of metal passing through a cupola. Ordinary films portraying a foundry, or, in fact, any industrial plant, do not show much, as the important features are often hidden by steel girders, plant or machinery. Where individual firms are unable to show films, these could be displayed at evening schools or at some other place to which apprentices of various firms in the district could be invited.

"The standard practices and theories of the various branches of foundrywork, such as iron, steel and non-ferrous principles, are adequately covered by the syllabus of the London City and Guilds Examination, classes for which are held in the principal industrial areas, covering an evening-class course of three years. Once the basic principles are picked up, the student is then able to follow more thoroughly and easily the technical books, Institute's proceedings, etc., and becomes more adaptable to carry out in practice the modern advancements. Visits to foundries, organised by the evening-school authorities and by the Institute, are also of important value in gaining practical knowledge and understanding of the studies.

Education Rewards

There is little doubt that there are few better ways of encouraging anyone to study than by rewarding them for their efforts. This could be done by an increased hourly rate according to classification from evening classes—but from proved results and not from recommendation, otherwise there is the likelihood of causing discontent if there is the slightest sign of favouritism. The more common method is by the giving of an annual prize, or a bonus paid out at holiday time.

Conclusions

In conclusion, and by way of summarising the general trend of the writers' views on the subject of foundry improvement, particularly as related to mental attitude, the following—comprising almost the whole of one Paper submitted—appears to be worthy of reproduction:—

"Much has been written in recent years about working conditions in the foundry. The general concensus of opinion seems to be that managements must

do all possible to improve the conditions by good housekeeping, best possible lighting and ventilation, provision of mechanical equipment for handling materials, installation of adequate washing facilities, by canteens, social welfare, apprenticeship schemes, etc. There is no doubt that the future is going to be bleak for any foundry that does not take steps, whenever circumstances permit, to ensure that the working conditions are the best possible.

"If we assume that the moulders are getting a good financial reward for their labours, and that the conditions in the foundry meet with the full approval of the idealists in our midst, it is the author's opinion that there still will be much to do to attract youths to the industry and keep them there.

"Good wages may make a man proud of his pay packet, and a model foundry may induce him to boast of the grand place he works in, but we must instil in him a pride in his craft. At the present time, this country's greatest need is coal. Most miners have the use of pit-head baths. They have a higher average wage than most other manual workers. They are given extra rations. But still the response to appeals for more coal and more recruits is disappointing. Why? It is because, in general, the miners have no pride in their job and deride it to all and sundry. Anyone listening to a group of miners discussing their work could have no desire to join their labours. In the same way, but fortunately to a lesser degree, many moulders detract from their job. The crux of the whole problem seems to lie in the mental attitude of the moulders at present in the foundry towards their craft.

A Typical Example

"Let us review the conditions in a typical provincial town of some 13,000 inhabitants where the main industry is ironfounding. The Vacancy Officer at the local Ministry of Labour Office finds that very few of the boys who want to learn a trade will consider going to a foundry. In fact, they usually say they will go anywhere except to a foundry. A group of fifteen boys who were intending to start their working lives in the following week were interviewed in one of the local schools. Only one boy had arranged to start work (as an apprentice electrical engineer); two thought they would like to be joiners, and the rest had no definite views. After talking to the boys on the advantages of learning a trade rather than going to 'dead-end' jobs, and then underlining the advantages of moulding in particular, it was learned that nine of the fifteen thought that moulding was hard, grinding, ill-paid work. They seemed to have gathered this impression from relatives and friends already in the foundries. The President of the Scottish Branch stated in his Presidential Address that he thought this ill-founded criticism came from outside the industry, *e.g.*, from Foundry Inspectors, etc., but the aforementioned experience indicates that a great deal of the loose, misleading talk comes from the foundry. It may be a hang-over from the days when foundries were dirty, untidy and had few, if any, mechanical aids, and is another instance of the old adage about giving a dog a bad name.

"In the same town is a small yard where they build and repair coastal lighters. The men employed there do caulking, carpentry, rivetting, etc., as the various branches of the trade are not kept separate as in the Clydeside yards. The working conditions are definitely worse than in any of the local foundries, as the men are exposed to the elements most of the time and have to manhandle quite heavy loads. The average wages are less than are paid to moulders, and yet a fair number of the boys leaving school want to become apprenticed there. Probably the reason for this unusual state of affairs is to be found in the way the work produced in the boat-yard is dramatised each time they have a launch. The boys see a finished product and think they would like to help to produce the next one. A more important factor is the pride the journeymen undoubtedly take in their engines, which seems to counteract the obvious disadvantages of their job. They are, therefore, less inclined to belittle their trade.

Long-term Policy

"It is in this direction that one must start the task of making the foundry more attractive. How often does a moulder produce an engineering casting without ever seeing it in its finished state or performing its true function? Too often he is inclined to think it is just a mess of iron and sand as it leaves his place for the fettling shop. Pains must be taken to dramatise the moulder's work by arranging for him to see the finished article. Experiments in this direction have been made locally with undoubted success. A group of moulders making marine engine castings were taken to see the finished engines. When they saw how attractive their casting looked when machined, and how important the function it performed, they naturally took more pride in its future production, with the result that they produced a better casting and had more satisfaction in doing it. Admittedly, it will not always be easy to develop this scheme, and it will always be a slow process to break down indifference or even antipathy, but, even if it took ten years of constant effort to change the attitude of the average moulder to the merits of his trade, it would be well worth it. Instead of frightening boys away from the foundry gate such moulders would be more likely to entice them in.

Immediate Procedure

"In the meantime, however, we must get a regular supply of apprentices, for it is with the apprentice that the industry can hope for its greatest success in any attempt to condition the mind of the artisan. Generally speaking, boys only come to the foundry after they have failed to get a job at some of the more popular trades, or, worse still, after they have been thrown out of a 'dead-end' job at the age of 17 or 18. Managements must go out and look for boys. Wherever possible, visits should be made to local schools, and boys should be invited to visit the foundry. For these visits, great care should be taken to ensure that the tour is arranged to give them the best possible impression, whilst yet presenting a true picture of the working conditions. Give them the true facts. Tell them they will have to work to be successful. Tell them they will get dirty in the process, but that they can get a

Making the Foundry More Attractive

bath before leaving the works, or, alternatively, that baths will be provided as soon as circumstances permit. Challenge them to take on a man's job, creating something of value to the community. Most boys of fifteen will react better to a challenge than they will to a 'do-your-duty' lecture or to any attempt to paint a ridiculous picture of the grand time they will have if only they will become apprentice moulders.

"In small ways it is possible to fan the spark of pride that is in most boys. For instance, all foundrymen know how difficult it is to get tools these days. It is easier for an employer to find a source of supply than for a boy to do so. Make him a present of his first set of tools and have his name engraved on them. The pride of possessing something that is truly his own property is likely to be followed by the desire to use the tools to create, in turn, something of credit to himself and his instructor.

Souvenir Castings

"In the early stages of their training it would be worth while to let the boys make a few castings suitable for taking home as souvenirs and samples of their work, *e.g.*, aluminium ash-trays. In some foundries this would mean making a few patterns, but in many foundries the patterns are already in existence though not always shown in the records kept by the management. Throughout their training, the 'know-how' must be closely related to the 'know-why.' It is surprising the number of times moulders have been asked why they do this or that, and have replied that they do not know but that, if they do not do this or that, they will lose the castings or the foreman will 'let them know.' Few men can put their heart into a task if they do not know why they are doing it. It would help to solve many problems if journeymen could also be taught more of the 'know-why,' but the difficulties of introducing a workable scheme are obvious. During apprenticeship a boy should not just be told to put a certain type of riser in a certain place, and to use a certain type of runner, but time should be spent in explaining the uses and limitations of the various methods. This will mean class-room work, but it would pay good dividends in holding the boy's interest and thus make him a better workman.

"Too often a boy just picks up a little second-hand knowledge of metals, etc., in a very haphazard way. His supervisor should be able to give him some positive instruction on all branches of ironfounding, not necessarily with a view to making him a foundryman but into a better craftsman with a pride in his craft and a sense of assurance that the industry he serves does play a very important part in the industrial scheme of things. A few ways of influencing a moulder's mental attitude have been mentioned, but anything and everything that could induce, say, 80 per cent. of the moulders in the trade to become conscious of the 'dignity of labour,' referred to earlier by Mr. Howard Wood, is worthy of consideration.

"To sum up: (1) Pay the highest wages compatible with sound economics; (2) take all possible steps to improve shop conditions; (3) provide reasonable welfare facilities.

"Any management with ample financial resources could solve these problems without too much difficulty. At any rate, they would be easier of attainment than the last point discussed, *i.e.*, to instil in the men and boys a sense of the 'worth-whileness' of their job. If this aim could be achieved they would be prepared to overlook minor deficiencies in economic and working conditions, and would be the ambassadors of the future who would attract and keep new recruits in the industry."

"Romance of Industry"

Finally, it must not be forgotten in these deliberations that there is something to be said for that aspect of organised manufacture called the "romance of industry." Sometimes this "romancing" is disparaged and interpreted ironically—sometimes not without very good cause, especially if exaggerated (as it could easily be if it were applied, for instance, to some foundries in their present state!)—nevertheless, it can not only be infinitely inspiring but also good, sound advertisement. It is, therefore, on this note that the Compiler closes by quoting the following contributed sentiments:—

"We should make the trade popular by telling the public about our attainments. The whole world knows about the wonderful achievements of aeronautics, but very few people outside the trade are aware of the vital contributions made to that field of success by the foundry. Yet how far would we have got to with the Spitfire, for example. if it had not been for the wonderful part played by the foundry in the production of the engine parts? Countless references have been made to those masterpieces of the shipping world, the "Queen Mary" and the "Queen Elizabeth," but have the foundries, without whose work those magnificent vessels could never have come into being, ever been spoken of? The public has heard of the linen that was required by the mile, the thousands of yards of carpets, and tons of steel and paint. But never a word has been said about the castings. Surely the foundry deserved publicity in the more than considerable part it played in the building of the world's greatest liners? Foundrymen should let the world know of the part they take in the production of such modern wonders as these, and become justly proud of their contribution. Thus a youth may be attracted to the trade and be proud of the part he himself plays. Well-handled propaganda has great possibilities, not only in the ordinary sense of commercial advertisement, but in holding the interest of the moulder and apprentice by giving each a real awareness of the great value of the work he does, and a consciousness of the fact that the rest of the world is admiring the achievements to which he contributes. There need not then be any fear of his disparaging his calling; he will, instead, feel a sense of real pride when his friends read about the part he plays in the production of many of the wonders of the modern world."

Institute Elects New Members

At a meeting of the Council held at the Old Town Hall, Cheltenham Spa, on June 14, the following were admitted to membership of the Institute of British Foundrymen.

FIRST LIST

As Subscribing Firm Member

E. Green & Son, Limited, Economiser Works, Calder Vale Road, Wakefield, Yorks (representative Mr. F. Oldershaw).

As Members

H. M. Barnes, works manager, National Refiners & Smelters, Johannesburg; F. Grew, foreman pattern-maker, Incandescent Heat Company, Limited, Smethwick; J. V. Harding, service engineer, International Meehanite Metal Company, Limited, London; B. Jones, director, Climax Molybdenum Company of Europe, Limited, Sheffield; K. M. Kundu, superintendent of melting department, Indian Government Mint, Calcutta; J. Lister, manager, research department, Stanton Ironworks Company, Limited, Nottingham; S. K. Rakshit, works manager, Tatanagar Foundry Company, Limited, India; *S. J. Timbrell, foundry manager, Whitehead Bros., Limited, near Leeds.

As Associate Members

J. Breslauer, works manager, A. Lowenthal, Johannesburg, South Africa; R. E. Curtis, D.S.O., D.F.C., B.A., apprentice, Charles Akrill, Limited, West Bromwich; E. L. Endres, metallurgist, Charles Carr, Limited, Smethwick; B. A. Flewitt, assistant foundry foreman and ratefixer, E. R. & F. Turner, Limited, Ipswich; A. K. Ghosh, engineer, Wm. Asquith & Company, Limited, Halifax; L. H. Grainger, works chemist and metallurgist, E. R. & F. Turner, Limited, Ipswich; L. G. Griffiths, pattern-maker-in-charge, Bersham Foundry, Limited, near Wrexham; A. A. Guest, foreman pattern-maker, Safanco, Limited, Johannesburg, South Africa; A. Habergham, foreman moulder, Modern Foundries, Limited, Halifax; P. Harratt, assistant foundry foreman, Edwards & Jones, Limited, Longton; P. K. Hart, foundry manager, Qualters & Smith Bros., Limited, Barnsley; G. B. Hobbs, B.Sc., foundry trainee, Edgar Allen & Company, Limited, Sheffield; D. L. John, foundry ratefixer, Bristol Aeroplane Company, Limited, Bristol; P. C. Kapur, assistant inspecting officer (castings), Ministry of Industry and Supply, Kulti, India; J. Kay, assistant foundry foreman, S. Russell & Sons, Limited, Leicester; S. R. Read, foundry manager, Incandescent Heat Company, Limited, Smethwick; F. Rider, iron moulder, E. & A. Ashworth, Limited, Dewsbury; A. Rudden, foundry chargehand, British Railways, Derby; E. B. Shenton, foundry metallurgist, Incandescent Heat Company, Limited, Smethwick; J. E. Slater, foundry foreman, Alfred Herbert, Limited, Coventry; E. Smith, technical representative, Lake & Elliot, Limited, Braintree; J. T. Taylor, floor moulder, De La Rue Gas Developments, Limited, Warwick; J. Welch, core-shop foreman, Hepworth & Grandage, Limited, Bradford; D. S. Wofindin, draughtsman, Firth-Vickers Stainless Steels, Limited, Sheffield; *A. Woods, foundry superintendent, Deritend Precision Castings, Limited, Birmingham.

As Associates (over 21)

G. F. Bailey, moulder, Ford Motor Company, Limited, Leamington Spa; D. S. Barson, metallurgical chemist, Sterling Metals, Limited, Coventry; L. E. Bettridge, pattern-maker, Incandescent Heat Company, Limited, Smethwick; D. R. Fardoe, foundry metallurgist, Morris Motors, Limited, Coventry; Miss C. J. Hanson, director, Molineux Foundry Equipment, Limited, London; E. P. Parkinson, metallurgist, Bristol Aeroplane Company, Limited, Bristol; H. S. Paul, apprentice mechanic (Foundry Group), E.I. Railway, Kanchrapara, India; M. Reading, technical representative, Foundry Services, Limited, Birmingham; A. J. F. Slade, core-maker, Sandcraft Foundry, Limited, Bristol; A. J. Standbridge, plant-layout draughtsman, Imperial Foundry Company, Leamington Spa.

As Associates (under 21)

E. J. Badham, pattern-maker, Hearsall Pattern & Castings Company, Limited, Coventry; J. R. Clough, apprentice pattern-maker, Elliott Musgrave, Limited, Bradford; R. W. Cooke, pattern-maker, Morris Motors, Limited, Coventry; D. H. Eastwood, laboratory assistant, Modern Foundries, Limited, Halifax; J. M. Greenhill, apprentice foundry metallurgist, Sterling Metals, Limited, Coventry; G. D. Haigh, laboratory assistant, Modern Foundries, Limited, Halifax; J. E. Longland, assistant metallurgist, Beeston Boiler Company, Limited, Nottingham; R. S. Newbould, laboratory assistant, Modern Foundries, Limited, Halifax; D. A. Osborne, apprentice pattern-maker, Sterling Metals, Limited, Coventry; J. R. Porter, pattern-maker, Morris Motors, Limited, Coventry; E. H. Proctor, apprentice foundry metallurgist, Sterling Metals, Limited, Coventry; H. Sykes, apprentice metallurgist, Samuel Osborn & Company, Limited, Sheffield; M. Thadhani, student apprentice, National Foundry College, Wolverhampton.

SECOND LIST

As Subscribing Firm Member

Metropolitan-Vickers Electrical Company, Limited, Trafford Park, Manchester, 17 (representative, A. Phillips).

As Members

*A. Boyes, assistant general manager, Ferrous Castings, Limited, Warrington; H. S. Pawson, general foreman, Garston Foundry Company, Limited, Liverpool; J. Scott, works manager, Sir J. Farmer Norton & Company, Limited, Salford.

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*Transferred.

Institute Elects New Members

As Associate Members

T. F. Allen, foundry foreman, Sir J. Farmer Norton & Company, Limited, Salford; A. Ashton, iron and brass moulder, Craven Bros., Limited, Stockport; R. Bennett, foundry manager, Thos. Crompton & Sons, Limited, Wigan; F. Clifton, foundry manager, Galena Works, Hammersmith, London; B. Cordall, foreman moulder, Newcast Foundries, Limited, Silverdale, Staffs; A. Davies, foundry superintendent, Thos. Platt & Sons (Widnes), Limited; C. D. Dennis, works manager, Barking Brassware Company, Limited, Barking, Essex; J. G. Gibson, assistant engineer, James Smethurst & Son, Limited, Warrington; R. Whiteley, foreman inspector, Howard & Bullough, Limited, Accrington.

As Associates (*over* 21)

A. Brookfield, assistant foreman, Davies & Metcalfe, Limited, Manchester; A. Butterworth, foundry foreman, Isaac Butterworth, Limited, Rochdale.

As Associates (*under* 21)

A. G. Grimshaw, foundry apprentice, Mather & Platt, Limited, Manchester; R. Lomas, apprentice moulder, Mather & Platt, Limited; C. A. Mangnall, apprentice moulder, Mather & Platt, Limited; M. B. Mather, apprentice moulder, Mather & Platt, Limited; G. H. McCourt, apprentice, Metropolitan-Vickers Electrical Company, Limited, Manchester.

United Steel's Production Records

Production of steel ingots by the United Steel Companies, Limited, Sheffield, in the year ended June 30 totalled 2,042,056 tons, which was 146,000 tons better than the record output attained in the previous year. It was also the first time that the organisation's annual output had exceeded 2,000,000 tons. United Steel's achievement constitutes a record for any British firm.

Other records were also broken. The Appleby-Frodingham branch at Scunthorpe made 830,000 tons of steel ingots, and the Steel, Peech & Tozer branch at Rotherham made 761,000 tons. It is believed that no other British steelworks has made as much as either of these. Both these branches and the Samuel Fox & Company, Limited, branch at Stocksbridge beat their previous records by substantial margins.

The cogging mill at Steel, Peech & Tozer, rolled almost 800,000 tons, which beat its last year's record by 82,000 tons. It is believed that this is a record for any one cogging mill in this country. The Templeborough melting shop at this branch alone made 573,000 tons of ingots.

MR. R. O. PRITCHARD, M.B.E., chief metallurgist of the Widnes Foundry & Engineering Company, Limited, died on July 21. He was made an M.B.E. in the Birthday Honours only last month, and had been in the service of the firm for 50 years.

Personal

MR. E. P. ASH has been elected a director of Albion Drop Forgings Company, Limited, Coventry.

MR. H. A. BONNEY, secretary and general manager of Follsain-Wycliffe Foundries, Limited, Lutterworth, has been appointed a director of the company. He will retain his other offices.

MR. JOHN NEILL has retired and MR. G. M. SMIBERT has resigned from the board of Richardsons, Westgarth & Company, Limited, marine engineers, etc., of Hartlepool. Mr. Smibert has also resigned from the boards of the company's subsidiaries.

MR. JOHN LECKY PHELPS has been appointed principal personal assistant to the managing director of Newton Chambers & Company, Limited, Sheffield, in succession to MR. E. N. BAYS, who has been appointed assistant general manager of the mobile engineering department.

MR. H. MCNAIR is leaving C. J. Baines & Company, Limited, at the end of September to commence business on his own account as an ironfounder and foundry and enamelling consultant. The premises he has acquired are near Stamford, and he proposes to specialise in light castings for the vitreous enamelling trade.

MR. W. W. S. ROBERTSON, joint managing director of W. H. A. Robertson & Company, Limited, builders of rolling mills, non-ferrous founders, etc., of Bedford, and a past-chairman of the Bedfordshire Association of the Engineering and Allied Employers' Federation, has been appointed chairman of the Eastern Regional Board of Industry.

MR. K. J. SHONE has been appointed head of the Department of Industrial Administration of the Royal Technical College, Glasgow, in succession to MR. J. M. S. RISK, who has taken up an appointment with the Scottish Gas Board. Mr. Shone is an hons. graduate in engineering of Cambridge, and is at present Associate Professor of Industrial Engineering at M'Gill University, Montreal.

MR. GUSTAVUS HENRY LATHAM, chairman and managing director of the Whitehead Iron & Steel Company, Limited, Newport, and a director of many other companies, has had the honorary degree of Doctor of Law conferred upon him by the University of Wales. Mr. Latham is also president of the British Iron and Steel Research Association, a past-president of the British Iron and Steel Federation and vice-president of the Iron and Steel Institute.

MR. JAMES HAMILTON has retired after 51 years in the shipbuilding industry, 27 of which were spent with Workman Clark & Company, Limited, Belfast, with whom he became shipyard manager, and the last 24 with Cammell Laird & Company, Limited, Birkenhead. In 1925 he was appointed manager for new shipbuilding with Cammell Laird & Company, and in December, 1940, was made a local director of the firm. In addition to being a member of various technical associations connected with the industry, Mr. Hamilton was for over 20 years a member of the Conference and Works Board of the Shipbuilding Employers' Federation.

News in Brief

THE TELEPHONE NUMBER of the Institute of Marine Engineers has been changed to Royal 8493.

TUBE INVESTMENTS, LIMITED, has made an offer, on behalf of a South African subsidiary to be formed, to acquire the Ace Cycle & Engineering Company, of South Africa. A shareholders' meeting has been convened by the company to consider the proposal.

THE EXPORTERS' SECTION of the Melbourne Chamber of Commerce is introducing a scheme for "listing" of exporters' names. The list will be circulated throughout the world, so that prospective buyers of Australian goods may refer to it before placing orders.

A SCHEME TO PREPARE youths for National Service has been instituted by Newton Chambers & Company, Limited, ironfounders, etc., of Sheffield. Under it apprentices due to be called for the Forces are being given a three-day course to show them what they may expect.

THE BRITISH IRON AND STEEL RESEARCH ASSOCIATION is to build a new research station on a 2½-acre site in Burnt Tree Lane, Sheffield. The building of the centre, which will have industrial-type laboratories, including a rolling mill and a furnace, is expected to start early next year.

INTERNATIONAL NICKEL COMPANY OF CANADA, LIMITED, has taken a two-year option on a nickel discovery 40 miles west of Thicket Portage, on the Hudson Bay Railway, for a sum unofficially reported to be around $250,000. Bulk samples during preliminary investigation ran just under 1 per cent. of nickel.

THE DIRECTORS of A.B.C. Coupler & Engineering Company, Limited, Wolverhampton, have under consideration the capitalisation of a small part of the present reserves and may be placing a proposal dealing with this before shareholders at an extra-ordinary meeting which will probably be called later in the year to adopt new articles.

THE MEMBERS of the United Kingdom Agricultural Engineering Mission to Canada have now returned to this country. They found that British agricultural machinery is virtually unknown in Canada, and their interim conclusion is that manufacturers in this country should take steps to publicise their wares by means of specialised export trade journals and catalogue material.

"IRON AGE" reports that cupola light-off smoke has been practically eliminated in several Chicago foundries by use of an electric coke lighter. It is comparatively inexpensive and simple to operate. It is also said to give a better bed and to improve the life of patches. No wood or combustion material other than coke breeze is required. Lighter is essentially an electric torch and takes 15 secs. to ignite the coke breeze.

ECURY MOTORS, P.O. Box 2, Aruba, Netherlands Antilles, is interested in obtaining agencies as sole distributors for United Kingdom manufacturers of copper tubing and fittings, small lighting plants, etc. Interested companies should contact the firm direct, at the same time notifying the Commercial Relations and Exports Department, Board of Trade, Thames House North, Millbank, London, S.W.1 (reference, C.R.E. (I.B.) 16816/1949), of any action taken.

THE DIRECTORS of Allied Ironfounders, Limited, Wellington, Shrops, have decided that the issued capital of the company should be brought into closer relation with the capital permanently employed in the business. Permission has been received from the Capital Issues Committee to make a bonus issue to ordinary shareholders of 696,560 ordinary shares, at the rate of two bonus shares for each existing five ordinary shares. It is proposed to capitalise £696,560 of reserves.

CONSENT OF THE TREASURY has been obtained by the Telegraph Construction & Maintenance Company, Limited, to increase the company's nominal capital to £1,500,000 and to capitalise £195,409 of the company's share premium reserve (which at December 31 last stood at £371,943) to be applied in paying up an equivalent amount of ordinary shares. The new shares are to be issued to shareholders as a bonus in the proportion of one new for every four shares held.

THE CAPITAL ISSUES COMMITTEE has sanctioned a proposal to capitalise £300,000 of the reserves of the Midland Electric Manufacturing Company, Limited, Birmingham, and the application of that sum in paying up in full 300,000 ordinary shares of £1 each. These are to be issued to shareholders in the proportion of two new ordinary shares for each ordinary share now held. The necessary resolution will be submitted to an extraordinary general meeting on August 15.

IRELAND imported iron and steel manufactures (excluding cutlery and machinery) to a total value of £588,564 in May, against £506,855 in May, 1948. The total value for the first five months of 1949 was £2,821,069, against £2,805,765 in the corresponding period of 1948. Exports of metalliferous ores, metals and manufactures during May, 1949, were valued at £37,915, against £25,475 in May, 1948, bringing the total value for the first five months of the year to £195,777 (£124,015).

UNDER ELECTRICITY LOAD-SPREADING ARRANGEMENTS for industry and commerce in Lancashire, Cheshire and the High Peak during October and November, 1949, and March, 1950, the peak hours and reductions from Monday to Friday are:—October, 10 per cent. cut between 8 a.m. and 9 a.m.; November, 10 per cent. cut between 8 a.m. and 10 a.m. and again between 4 p.m. and 5.30 p.m.; March, 20 per cent. cut between 8 a.m. and 10 a.m. In total these reductions are roughly 75 per cent. of last winter's load-spreading requirements.

AT A MEETING of George Adlam & Sons, Limited, bottling-plant and machinery manufacturers, etc., of Bristol, on July 15, Mr. S. H. Gillett, chairman, said that if the company was to reach the target contemplated by its board it was clear that it would find it necessary to increase substantially its working capital to finance the increased stock and work in progress. He stated that three-quarters of the £60,000 new money provided by the issue of loan stock in November, 1947, had been absorbed, and he declared that the present high rates of taxation prevented companies from building up a sufficiency of working capital out of undistributed profits.

Company News

(Figures for previous year in brackets.)

RIPPINGILLES—Dividend of 7½% (same).
DRAKE & MOUNT—Dividend of 7½% (same).
NOBLE & LUND—Interim dividend of 15% (same).
HILLHEAD HUGHES—Interim dividend of 5% (2½%).
AVELING-BARFORD—Interim dividend of 5% (same).
SERCK RADIATORS—Interim dividend of 10% (same).
W. H. DORMAN & COMPANY—Dividend of 37½% (same).
BLYTHE COLOUR WORKS—Interim dividend of 20% (same).
RICKETT, COCKERELL & COMPANY—Dividend of 10% (same).
METAL INDUSTRIES—Final dividend of 7%, making 10% (same).
CHARLES CARR—Final dividend of 40% (65%), making 100% (125%).
H. J. BALDWIN & COMPANY—Final dividend of 15%, making 25% (same).
BEESTON BOILER COMPANY—Final dividend of 27½%, making 37½% (same).
SMETHWICK DROP FORGINGS—Final dividend of 17½% (15%), making 30% (25%).
MANLEY & REGULUS—Final dividend of 10% and bonus of 10%, making 25% (same).
PARMITER, HOPE & SUGDEN—Dividend of 30% (same) and jubilee bonus of 20% (nil).
C. H. BAILEY—Final dividend of 12½% (same), making 22½% (20%), plus capital bonus of 5% (same).
RICHARDSONS, WESTGARTH & COMPANY—Dividend of 10% (8%, plus distribution of 2%, tax free, from capital reserve).
HARTLEY & SUGDEN—Net profit to April 30, £11,137; tax over-provision, £2,294; to general reserve, £10,000; preference dividend, £91; ordinary dividend of 8½% (6% for 10 months); forward, £2,369 (£2,236).
A.P.V. COMPANY—Consolidated accounts for 1948 show net trading profit, £320,092; royalties, £15,107; income from trade investment, £1,316; to depreciation, £51,915; bank interest, £18,279; audit, £637; net profit, £265,684; to tax, £136,000; profit sharing staff bonus, £45,758; dividends, £29,738; forward, £377,966 (£323,778).
ARON ELECTRICITY METER—Profit to March 31, £45,169; to income tax, £22,684; profits tax, £7,822; loss of subsidy, £697; leaving £13,966 (£27,289); dividend of 15% (same); forward, £26,929 (£25,498). Sundry balances amounting to £60,204, previously included in current liabilities and provisions, are now "free" and have been transferred to reserves.
J. H. SANKEY & SON (HOLDINGS)—Consolidated trading profit for the year ended March 31, with sundry revenue, £140,012; to depreciation, £15,830; directors' emoluments, £20,898; audit fees, £1,469; profit, subject to tax, £101,815; to tax, £59,167; capital reserve proportion of profits prior to incorporation, £24,604; dividend equivalent to 20% per annum; forward, £9,451.
CRITTALL-HOPE METAL WINDOWS (SOUTH AFRICA)—Trading profit to February 28, £183,571 (£173,916); to directors' fees, £2,900 (£2,000); depreciation, £19,016 (£16,676); net profit, before tax, £161,655 (£155,240); to taxation, £45,000 (£42,792); dividend, £65,000 (£62,500); pension extension scheme, £11,500 (£6,000); general reserve, £27,500 (£25,000); forward, £17,897 (£16,242).
CALEDON SHIPBUILDING & ENGINEERING COMPANY (made public April, 1948)—Trading profit to March 31, £205,109 (£150,543); other income, £5,148 (£3,201); to directors' remuneration, £21,750 (£18,420); auditors remuneration, £500 (same); depreciation, £36,580 (£36,694); income tax, £60,000 (£50,000); profits tax, £22,250 (£20,000); net profit, £69,177 (£28,130); to general reserve, £50,000 (nil); preference dividend reserve, nil (£15,000); dividend of 10% (same); forward, £54,471 (£50,694).
A.B.C. COUPLER & ENGINEERING COMPANY—Consolidated profit and loss account for the year ended September 30, 1948, shows trading profit, subject to adjustment of certain selling prices, of £50,028 (£48,658); dividends and interest, £486 (£977); to taxation, £24,965 (£25,850); pensions and life assurance, £3,000 (same); development work, etc., £9,500 (£3,571); deferred repairs and rehabilitation, nil (£1,000); leaving £13,149 (£16,214); surplus taxation provision, £3,508 (nil); additional profit for 1947, £469 (£425); dividend of 20% (same); general reserves, £10,856 (£11,267); forward, £18,737 (£16,014).
EDGAR ALLEN & COMPANY—Trading profits balance to April 2, £483,600 (£430,887); other income, £28,263 (£70,919); to depreciation, £43,250 (£43,137); pension, £9,084 (£7,312); further provision for unrealised profit on inter-company stocks, £5,622 (£5,569); further provision for specified contracts in progress, £9,500 (£3,750); directors' remuneration, £15,365 (£14,711); leaving £429,042 (£427,327); to profits tax, £50,000 (£42,000); income tax, £178,000 (£171,500); fixed assets reserve, £50,000 (£100,000); stock and contract contingencies reserve, £25,000 (same); pensions, £50,000 (nil); general reserve, £31,534 (£20,000); dividend of 12½% (same) and bonus of 5% (nil), £27,652 (£19,752); forward, £94,897 (£86,291).
MIRRLEES WATSON COMPANY—Consolidated profit and loss account for the year ended March 31 shows trading profit, after administrative expenses and directors' emoluments, £268,710 (£227,501); other income, £1,932 (£3,531); to depreciation, £13,394 (£14,608); taxation, £142,910 (£93,500), etc.; proportion of profit in a subsidiary company applicable to minority shareholders, £672; consolidated net profit, £111,553 (£52,082); taxation, £15,784 (nil) and doubtful debts £2,869 (nil) not required; brought in, £30,989 (£4,059); available group balance, £161,195 (£56,141); to subsidiary companies' general reserve, £50,000 (nil); holding company general reserve, £50,000 (nil); dividend reserve, £20,000 (nil); deferred repairs reserve, nil (£2,500); dividend of 8% (same); forward, £18,543.
AMALGAMATED METAL CORPORATION—Consolidated trading profit for 1948, including net profit on realisation of investments of subsidiary finance companies, £321,804 (£304,105, adjusted); dividends and interest, £139,611 (£144,576); profits, less losses, on sale of fixed assets, £14,636 (nil); provisions no longer required, £9,800 (nil); to audit fees, £2,926 (£2,139); depreciation, £26,589 (£14,421); profits tax, £71,478 (£74,760); income tax, £171,962 (£181,824); written off goodwill and preliminary expenses, £4,975 (nil); outside shareholders' interest in profits, less losses, of subsidiaries, £7,247; leaving £200,674 (£177,603); to dividend on Amalgamated Metal preference shares, and 5% (5%) on the ordinary shares, less tax, £163,883; leaving £36,791 (brought in, £574,433, less debit balance of subsidiary not consolidated at December 31, 1947, after deducting debit balance of subsidiary sold during 1948, £17,632).
JOHNSON, MATTHEY & COMPANY—Consolidated profit and loss account for the year ended March 31 shows manufacturing and trading profit, £673,797 (£871,880); dividends from investments, £2,897 (£4,344); exchange profits on inter-company balances, £5,773 (nil); stock reserve not required, £15,450 (£15,925); to depreciation, £84,286 (£33,475); mortgage interest, £144 (£122); debenture interest, nil (£7,678); unsecured convertible loan stock interest, £35,000 (£4,583); new issue expenses, nil (£31,875); taxation £318,107 (£453,925); reserves by subsidiaries, plant, £1,967 (£5,000); applicable to outside shareholders' subsidiary companies, £13,374 (£6,069); undistributed profit of subsidiary companies applicable to parent company, £107,220 (£81,168); balance, being profit parent company, £137,819 (£263 254); brought in, £582,345 (£393,111); dividend of 12% (dividend of 6% and bonus of 6%); off goodwill, nil (£24,999); staff fund, £3,500 (same); forward, £678,054.
JOHN THOMPSON—Group trading profit for 1948, £721,530 (£370,329); reserve for deferred repairs, £23,177 (£36,962); investment income, £27,554 (£23,892, including tax credits); to depreciation, £83,282 (£65,930); pensions, £26,994 (£24,858); audit fees, £2,041 (£1,941); tax, £330,017 (£219,761, including E.P.T.), leaving £334,927 (£118,683); brought in, £370,930 (£414,208); from subsidiary reserve, £774; tax and other credits, £17,154; profit on investment realisations, nil (£6,664); available, £723,785 (£539,555); to loss on realisation of investments, £5,477; capital issue expenses, nil (£184); preference dividends of holding company, £13,213 (same); final ordinary dividend of 10% (12½%) and bonus of 5% (same), making 22½% (same); investments reserve, £1,050 (£26,350); contingencies, £5,000 (nil); general reserve, £175,000 (£50,000); dividend reserve, nil (£15,000); bad debts reserve, £1,700 (nil); forward, £458,467.
MORGAN CRUCIBLE COMPANY—Consolidated accounts, including parent and one subsidiary, to March 31, and remaining subsidiaries to December 31, show balances from trading.

(Continued on page 133.)

Obituary

MR. ROBERT J. CAMPBELL, a director of Lithgows, Limited, ship builders and repairers, of Port Glasgow, died suddenly on July 13.

MR. L. W. RIGBY, Lancashire and Yorkshire representative of J. W. Jackman & Company, Limited, Manchester, died recently.

MR. ARTHUR DRIVER, who has died after a short illness, was works manager for S. Dixon & Sons, Limited, engineers, non-ferrous metal founders, etc., of Leeds.

MR. W. B. ATKINSON, chairman of Octavius Atkinson & Sons, structural engineers, of Harrogate, died on July 13. He was 73, and had been actively connected with the firm for 60 years.

SIR ERNEST VARVILL HILEY, who died suddenly last week, was chairman of Glover & Main, Limited. He was also a director of R. & A. Mains, Limited, Main Water Heaters, Limited, Thomas Glover & Company, Limited, and the Victaulic Company, Limited.

MR. ARCHIBALD G. LOGAN, O.B.E., a former Provost of Falkirk, who died recently aged 83, started life as a moulder in a local foundry. He was a pioneer of the Trade Union movement and for many years was organiser and treasurer of the Ironfounding Workers' Association. He was a member of the Joint Advisory Committee on Conditions in Ironfoundries.

MR. EDGAR G. HARCOURT has died at his home in Birmingham at the age of 79. In 1910 he succeeded his father as managing director of Harcourts, Limited, and in 1920, when the business was divided into two companies, he joined his brother, Mr. B. Harcourt, as a director of David Harcourt, Limited. He also became a director of Tonks (Birmingham), Limited.

MR. EDGAR SEYMOUR BAKER, who died suddenly in London on Friday, joined the National Association of Iron and Steel Stockholders in 1940. He was formerly connected with Ucometal Products, Limited. Mr. Baker had many friends in the trade, including his colleagues at the British Federation of Iron and Steel Stockholders, to which the National Association of Iron and Steel Stockholders is affiliated.

Edgar Allen's Bonus Payment

In his report accompanying the full accounts, Mr. W. H. Higginbotham, chairman of Edgar Allen & Company, Limited, steelmakers, etc., of Sheffield, says that the directors have considered the effect of substantial prospective cash disbursements in discharge of taxation liabilities, the increasing pressure for reduction in prices (with its inevitable effect on earnings) and the renewed appeal of the Chancellor of the Exchequer for moderation in distribution of profits.

"Your directors conclude that, so long as the necessity remains for retaining taxed profits as working capital, and failing any reduction in the high level of taxation, any substantial increase in dividend distribution is inadvisable," he says, "but in view of the trading results of this and the previous year, they have decided to recommend a bonus distribution of 5 per cent. on the ordinary share capital."

The directors have under consideration the restoration of the paid-up value of the ordinary shares to £1 each. The present nominal value is 13s. 4d., following the capital reduction in 1935.

Hopes of More Trade with Latin America

The importance in our national economy of the maintenance and, indeed, the increase of our trade with South America was emphasised by Mr. Harold Wilson, President of the Board of Trade, in his speech at the annual luncheon of the British and Latin-American Chamber of Commerce. Our natural preoccupation with dollar exports, and the emphasis which the Commonwealth finance conference would lay on the vital need for yet closer economic relationships with our sister nations of the Commonwealth, might perhaps cause our exporters to forget that point.

It would be our endeavour to build up our trade further with the Latin-American markets so that we could pay our way for the increased imports that we hoped to be getting this year and in the years that lay ahead.

(*Continued from page* 132.)

after directors' emoluments, £1,282,197 (£1,449,589); investments income, £32,306 (£33,459); provisions no longer required —trading £26,393 (£23,710) and tax £72,239 (nil); to depreciation, £136,741 (£128,587); deferred repairs, nil (£8,305); audit fees, £4,616 (£3,994); interest on employees' loan obligations, £828 (£1,031); foreign tax, including adjustments, £30,848 (£25,823); profits tax, £182,841 (£213,818); income tax, £428,785 (£543,271); credit foreign tax relief, £25,436 (£19,448); to preliminary expenses of a subsidiary, £2,925 (£1,244); leaving £650,987 (£599,533); parent company's balance, £540,380 (£522,937); brought in—after £7,250 (nil) to capital reserve being amounts capitalised by wholly-owned subsidiaries—£112,473 (£100,831); to general reserve, £275,000 (£175,000); rehabilitation, nil (£100,000); final dividend of 8½%, making 12% (same); forward, £148,808.

RENOLD & COVENTRY CHAIN COMPANY—Consolidated acounts of holding company and the British subsidiary for the year to April 3 show:—Profit, £813,460 (40 weeks to April 4, 1948, £499,607, after charging £14,871 of abnormal expenses to contingencies reserve); investment income, £7,914 (£4,845); to directors' fees, emoluments and pensions, £53,647 (£32,788); depreciation and renewals, £243,883 (£168,427); leaving £523,844 (£303,237); to profits tax, less net special relief arising from initial allowances on new capital expenditure, £74,600 (£51,975); combined profit, £449,244 (£251,262)—Renold & Coventry Chain Company £444,331 (£238,833), British subsidiary £4,913 (£12,429); to income tax, including reserve for income tax 1949-50, less net special relief, £184,985 (£96,346); net available profit, £264,259 (£154,916); brought in, £82,138 (£53,904); tax over-provision, £36,688 (£77,714); to appropriations by holding company—reserves £173,000 (£122,809), dividends £102,560 (£81,587); forward, £107,525 (£82,138)—Renold & Coventry Chain Company £71,037 (£47,109), British subsidiary £36,488 (£35,029).

Imports and Exports of Iron and Steel

The following tables, based on Board of Trade returns, give figures of imports and exports of iron and steel in June. Figures for the same month in 1947 and 1948 are given for purposes of comparison.

Total Exports of Iron and Steel.

Destination.	Month ended June 30.		
	1947.	1948.	1949.
	Tons.	Tons.	Tons.
Channel Islands	696	704	853
Gibraltar	188	89	66
Malta and Gozo	150	492	98
Cyprus	531	298	59
British West Africa	2,614	2,472	9,986
Union of South Africa	16,691	12,288	13,693
Northern Rhodesia	1,372	933	1,044
Southern Rhodesia	2,632	1,928	2,311
British East Africa	8,713	6,507	9,184
Mauritius	134	712	1,091
Bahrein, Koweit, Qatar and Trucial Oman	1,430	1,684	1,486
India	7,222*	5,258	7,924
Pakistan		1,689	3,343
Malaya	2,651	2,218	6,876
Ceylon	822	638	1,642
North Borneo	607	2,818	551
Hong Kong	1,460	3,194	3,180
Australia	2,733	5,708	6,830
New Zealand	3,018	3,942	7,643
Canada	2,261	2,291	6,151
Bermuda	36	23	39
British West Indies	3,309	2,529	6,696
British Guiana	347	464	438
Anglo-Egyptian Sudan	1,006	681	794
Other British countries	420	935	1,067
Irish Republic	6,864	6,146	4,890
Russia	—	30	249
Finland	5,405	6,486	4,934
Sweden	11,014	8,765	5,466
Norway	4,386	7,349	4,257
Iceland	365	623	1,438
Denmark	7,651	5,757	5,269
Poland	42	7	40
Germany	48	57	112
Netherlands	6,808	9,139	8,339
Belgium	1,601	924	622
France	1,312	735	3,786
Switzerland	1,761	1,614	1,084
Portugal	2,089	1,784	1,640
Spain	549	505	1,779
Italy	1,108	603	315
Hungary	305	218	232
Czechoslovakia	172	33	1
Greece	2,335	93	120
Turkey	1,632	1,269	437
Dutch East Indies	2,171	2,457	1,547
Dutch West India Islands	1,074	996	1,486
Belgian Congo	31	86	44
French W. and Eq. Africa	22	50	47
Portuguese East Africa	908	127	237
Canary Islands	287	689	425
Syria	423	768	25
Lebanon	411	1,164	563
Palestine (Israel)	4,299	1,205	1,024
Egypt	2,450	5,453	2,827
Morocco	60	161	22
Iraq	5,955	5,073	11,743
Iran	4,579	10,220	11,135
Burma	4,254	3,237	388
Siam (Thailand)	184	717	164
China	2,376	1,472	243
U.S.A.	369	196	43
Cuba	66	82	16
Colombia	398	777	568
Venezuela	4,321	4,397	5,900
Ecuador	630	87	45
Peru	137	264	274
Chile	1,653	957	158
Brazil	382	64	1,293
Uruguay	710	495	723
Argentine	6,336	6,073	2,316
Other foreign countries	3,289	1,899	2,872
Total	164,265	161,807	184,183

* Figures for 1947 relate to British India.

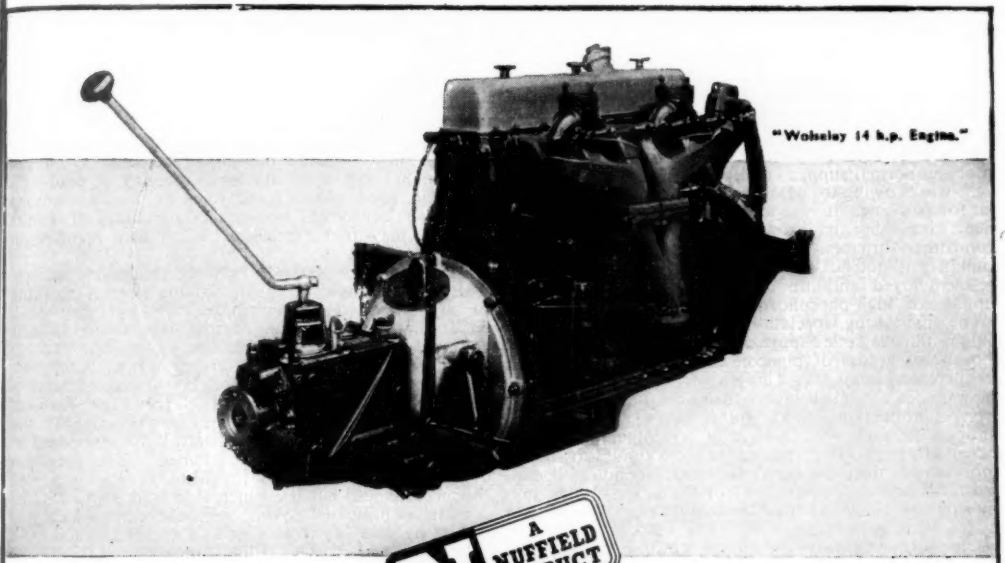
Total Imports of Iron and Steel.

From	Month ended June 30.		
	1947.	1948.	1949.
	Tons.	Tons.	Tons.
Australia	5,020	993	6,024
Canada	10,519	10,419	5,786
Other British countries and the Irish Republic	9	324	4,247
Sweden	1,161	1,417	1,990
Norway	2,251	2,518	3,238
Germany	119	18	2,028
Netherlands	38	2,649	14,033
Belgium	3,891	13,414	51,610
Luxemburg	690	453	25,352
France	53	2,752	27,982
U.S.A.	20,913	9,837	34,251
Other foreign countries	49	343	9,341
Total	44,713	45,137	185,882
Iron ore and concentrates—			
Manganiferous	—	—	4,000
Other sorts	436,495	807,902	854,262
Iron and steel scrap and waste, fit only for the recovery of metal	38,750	60,710	188,148

Exports of Iron and Steel by Product.

Product.	Month ended June 30.		
	1947.	1948.	1949.
	Tons.	Tons.	Tons.
Pig-iron	4,494	98	138
Ferro-alloys, etc.—			
Ferro-tungsten	91	41	117
Spiegeleisen, ferro-manganese	299	65	381
All other descriptions	52	83	37
Ingots, blooms, billets and slabs	999	568	168
Iron bars and rods	711	448	478
Sheet and tinplate bars, wire rods	78	518	675
Bright steel bars	2,593	1,696	1,148
Other steel bars and rods	12,067	9,335	12,367
Special steel	1,656	1,599	1,043
Angles, shapes and sections	8,029	6,876	8 672
Castings and forgings	562	373	794
Girders, beams, joists and pillars	3,242	1,057	1,833
Hoop and strip	2,806	3,120	4,305
Iron plate	2	275	328
Steel plate, ¼ in. thick and over	10,938	9,565	16,508
Do., under ¼ in. thick	6,876	7,200	11,386
Galvanised sheets	4,402	6,799	6,686
Tinplates	12,473	14,094	11,255
Tinned sheets	186	428	319
Terneplates	11	33	5
Decorated tinplates	12	92	32
Other coated plates	286	377	684
Cast-iron pipes, up to 6-in. dia.	4,788	4,885	6,062
Do., over 6-in. dia.	4,163	6,468	5,282
Wrought-iron tubes	23,000	31,254	32,766
Radiators, central-heatg. boilers	362	256	294
Railway material	18,794	11,287	13,924
Wire	2,952	3,021	4.300
Cable and rope	2,393	2,552	2,968
Netting, fencing and mesh	1,663	1,339	1,950
Other wire manufactures	635	744	912
Nails, tacks, studs, etc.	1,013	882	718
Rivets and washers	842	896	654
Wood screws	420	369	251
Bolts, nuts and metal screws	2,052	1,809	2,267
Stoves, grates, etc. (excl. gas)	655	1,103	758
Do., gas	150	239	147
Sanitary cisterns	97	152	170
Baths, sinks, etc.	288	773	997
Fencing material	704	343	380
Anchors, etc.	700	708	619
Chains, etc.	712	819	1,084
Springs	352	701	805
Hollow-ware	5,831	8,008	5,895
All other manufactures*	18,834	18,459	21,621
Total	164,265	161,807	184,183

* Figures for 1949 are not completely comparable with those for previous years.



A NUFFIELD PRODUCT

Using

STANTON-DALE

REFINED PIG IRON

USED AND RECOMMENDED
FOR ALL HIGH-DUTY
ENGINEERING CASTINGS

THE STANTON IRONWORKS COMPANY LIMITED, Nr. NOTTINGHAM

Raw Material Markets

Iron and Steel

Pig-iron and hematite are accepted by the foundries to the full extent of current production and supplies of some grades are insufficient to fulfil all demands. This applies particularly to the high-phosphorus grade for the light foundries, many of which will be unable to obtain normal supplies of iron for a period of six to eight weeks owing to a Derbyshire furnace being blown out for patching. It is reported, however, that arrangements are being made to supply users with tonnages from other furnaces. Demand for castings from these foundries is not heavy, but they continue to be fairly well employed and are able to absorb all available supplies of high-phosphorus iron.

The engineering, speciality and jobbing foundries are taking all available supplies of low- and medium-phosphorus grades of pig-iron and many of them call for increased tonnages. The potential requirements for these grades are much higher than actual deliveries and present production cannot fully satisfy the demand; consequently, users are having to buy other grades at increased prices. Hematite deliveries continue to show improvement due, chiefly, to the better supply of basic pig-iron from abroad. Parcels of the refined grade of pig-iron are being exported, but the prospects of other grades being permitted for export are remote.

Improved supplies of scrap are now available, and most foundries have fair quantities of both cast-iron and steel scrap on hand. Supplies of foundry coke are sufficient for current usage and in most cases provide some balance for stock. Few complaints are received of quality and size, although there are isolated reports of trouble being experienced owing to the high sulphur content.

Coke for heating and core-oven requirements is also in good supply and users have no difficulty in securing supplies of ganister, limestone and firebricks. Stocks of the latter are low and extended delivery is required for production. Ferro-alloys for the engineering foundries are fairly plentiful.

Outputs from the re-rollers continue to be satisfactory. Order-books are good and available supplies of steel are sufficient to meet requirements. The light re-rollers are now able to supply sections, bars, and narrow strip approaching customers' requirements and have been able to clear up many long-standing commitments. Sheet mills are obtaining better supplies of sheet bars, mostly from abroad, and while outputs have improved they have plenty of business to keep them fully occupied for some time ahead. Outputs from the heavier mills are in keeping with requirements and production is high.

Non-ferrous Metals

United Kingdom prices of zinc and lead have moved up again following increases on the other side of the Atlantic. There was an increase of ½ cent in the U.S. zinc quotation, making the current price 10 cents per lb.; the increase in lead was one of ¼ cent to 14¼ cents per lb. As from Tuesday last, the Ministry of Supply's prices for these metals were raised by £2 15s. and £1 7s. 6d. per ton, respectively, making the current figure for good ordinary brand zinc £63 10s. per ton and that for good soft pig-lead £82 7s. 6d. per ton.

Copper is being offered freely in the U.S. at 17⅛ cents per lb. and, as in this country, there is no rush to buy, only a steady day-to-day demand on an improving but still moderate level. Buying of lead continues in good volume, and some nervousness among American consumers about the adequacy of future supplies may find expression in another increase in price.

Zinc has no expectations from the stockpiling agency, and its price trend is subject to the normal working of supply and demand. Business is not very brisk either on the other side of the Atlantic or in this country.

Consumers in Britain are settling down to the new prices and regulations, but the heavy premiums now required by the Ministry of Supply for forward delivery have caused some concern. Presumably the three months' premium, at least, will be embodied in the Ministry's prices to its customers. The premium over wire bars asked by the Ministry for imported copper wire rods has been increased from £6 to £9 15s. per ton to bring it into line with the extra which has had to be paid for some time to Canadian rollers.

With the Ministry's selling prices now linked to prices in America, a special interest is being shown here in U.S. market movements. Hitherto, these were important in fixing the Ministry's buying prices, but they now control its selling prices as well, and this state of affairs emphasises the post-war domination of the U.S. in the copper, lead, and zinc markets. In pre-war days, dealings on the London Metal Exchange fixed sterling quotations that were used wholly in this country, and largely on the Continent, as a contract basis, and as often as not determined U.S. export prices.

Any tendency shown by Exchange prices to rise above U.S. domestic quotations, which operated behind tariff walls, would normally be taken advantage of, and checked, by U.S. custom smelters selling in this country.

THE RAILWAYS are to carry out tests with radio to ascertain whether it would facilitate any traffic or engineering operations. Announcing this, the Railway Executive reports that, in addition to fixed radio stations, tests will be carried out with transportable equipment and portable sets for use on vehicles, and by staff on the ground. The tests envisaged will, for example, determine the possible value of wireless for:—(1) Communication between shunting-engine drivers, ground staff and control towers in marshalling yards; (2) communication between staff during extensive engineering operations; and (3) communication from a central depot to road cartage collection and delivery vans.